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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

NEW SERIES.—LXX.

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BY I. M. JOHNSTON.

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I. STUDIES IN THE BORAGINACEAE,—II.

1. A Synopsis of the American native and immigrant Borages of the Subfamily Boraginoideae.

The following summary of the American *Boraginoideae* is the result, first, of a critical examination and study of the generic lines within the subfamily, and, second, of a careful study of the bibliography of the group and a serious attempt to identify as many as possible of the poorly understood or unidentified species. The data accumulated have been fashioned into a synopsis containing new keys to both genera and species, and such precise information as to specific distribution as available specimens and reliable records will permit. For the territory south of Mexico the occurrence of introduced species has been given by countries, but to the north the occurrence has been given by states. An attempt has been made to distinguish between reports based upon published records, and those founded upon specimens personally examined, all records of the latter sort being indicated by the exclamation sign. No attempt has been made to treat the genus *Cryptantha* which is being reserved for a subsequent paper. Such genera as *Amsinckia* or *Plagiobothrys* which have had recent revision are not treated in detail; instead, merely the reference to the latest published review has been cited.

The study of the South American members of the subfamily has been practicable only through the courtesy of Dr. W. R. Maxon and Dr. N. L. Britton who have loaned for my study, in conjunction with the material in the Gray Herbarium (G), that from South America contained in the United States National Herbarium (US) and the New York Botanical Garden (NY). Invaluable for my study of *Pectocarya* was the Southern Californian material of that genus contained in the Baker Herbarium of Pomona College (P) and loaned me by Dr. P. A. Munz.

Key to Genera.

Attachment of nutlet surrounded by a tumid annular rim, rather strongly convex or plug-like, leaving a pit upon the flat or low-convex gynobase. *Anchuseae.*

Stamens appendaged dorsally, closely crowded about the style; corolla rotate, suggesting that of a *Solanum* ..... 1. *Borago.*

Stamens unappendaged, included within the decidedly tubular corolla.

Corolla lacking faucal appendages or these represented by villous spots ..... 2. *Nonea.*

Corolla with definite faucal appendages formed by the intrusion of tissue.

Corolla broadly tubular; throat conspicuously developed and campanulate-dilated; lobes short, erect or with tips recurved; faucal appendages lanceolate, acute, margins denticulate.....3. *Symphytum*.
Corolla funnel- or salver-form; throat ill-defined, abruptly expanding or absent; lobes usually elongate, spreading or divergent; faucal appendages deltoid or oblong, obtusish, usually hairy.
Corolla-tube distinctly bent near middle, limb subirregular and oblique.....4. *Lycopsis*.
Corolla-tube straight, limb perfectly regular, not oblique.....5. *Anchusa*.
Attachment of nutlet without an annular rim, flat or somewhat concave, not leaving a pit on the gynobase.
Stigmas geminate or style bifid. *Lithospermeae*.
Corolla more or less irregular, oblique; stamens unequal.....6. *Echium*.
Corolla regular or only very obscurely irregular, stamens equal.
Calyx cylindrical, merely toothed; teeth short, triangular, not half length of tube, usually connivent over fruit; one nutlet normally developed this persistent and falling enclosed in calyx; pubescence in part of uncinate hairs.
Inflorescence naked, very dense.....7. *Moritzia*.
Inflorescence leafy-bracted, open.....8. *Thaumatocaryon*.
Calyx cut to near base; lobes linear or lanceolate, much longer than tube; four nutlets normally developed; these falling separately and not enclosed in the calyx, which is persistent; pubescence of straight hairs.
Corolla very large, 2.5–8 cm. long, lobes acute; stamens very long, reaching at least to corolla-sinuses and frequently much beyond.....9. *Macromeria*.
Corolla of small or medium size, less than 2.5 mm. long; stamens very short, included and not approaching corolla-sinuses.
Filaments ligulate; anthers densely hirsute dorsally; corolla-lobes short, rounded, erect.....10. *Lasiarrhenum*.
Filaments filiform; anthers glabrous.
Corolla-lobes acute or acuminate, erect; style long-exserted, protruded as the buds open; anthers sagittate.....11. *Onosmodium*.
Corolla-lobes rounded or obtuse, ascending or spreading or recurved; style included or short-exserted, never protruded until flower is fully opened; anthers oblong.
Nutlets attached to a flat gynobase by a large broad centered basal attachment, usually smooth and shiny but occasionally tuberculate-roughened; leaves alternate....12. *Lithospermum*.
Nutlets attached suprabasally and obliquely to a pyramidal gynobase or attached to a flat gynobase by a small strongly eccentric substipitate basal prolongation of the ventral keel, always tuberculate- or rugose-roughened, dull; lower leaves usually opposite.....13. *Antiphytum*.

Stigmas solitary and simple, capitate or disk-shaped, occasionally emarginate.
Nutlets attached near the apical end, divaricate or distinctly divergent, anterior face forming a right angle or a very broad acute angle with the floral axis. *Cynoglosseae.*
Dorsal surface of nutlets rather uniformly covered with glochidiate filiform or subulate appendages, rarely margined and then merely by a wrinkle in the pericarp.
Nutlets lenticular, very depressed; cauline leaves on slender petioles at least half as long as the deeply cordate blades; plants weak and trailing.....14. *Mimophytum.*
Nutlets turgid, usually compressed-ovoid; cauline leaves sessile or on very short winged petioles which are very much shorter than the linear to oblanceolate blades; plants erect.....15. *Cynoglossum.*
Dorsal surface of nutlets naked or occasionally covered with uncinate appendages, with a callous or chartaceous margin that is entire or serrate or with uncinately tipped subulate teeth or appendages.
Fruiting pedicels nodding or reflexed, coarse, stiff, shorter than nutlets; corolla minute, tubular or salverform; nutlets flat or convex and somewhat ovate or elongate, with the toothed or undulate margins usually armed with uncinate hairs.....16. *Pectocarya.*
Fruiting pedicels various, usually flexuous, much longer than nutlets; corolla conspicuous, subrotate or rotate-tubular; nutlets with cupulate margins which lack uncinate hairs or teeth.....17. *Omphalodes.*
Nutlets attached near base or middle, more or less erect and parallel, anterior face paralleling floral axis or forming a very narrow acute angle with it.
Fruiting calyces extraordinarily irregular, three lobes nearly distinct, the other more united, enclosing the fruit and becoming cornute with 7–9 long glochidiate processes; ovules 2. *Harpagonelleae*.....18. *Harpagonella.*
Fruiting calyces regular or practically so, not armed with cornute glochidiate processes; ovules usually 4. *Eritrichieae.*
Corolla-lobes convolute in the bud; herbs with usually ebracteate racemes and smooth narrowly and basally attached nutlets.....19. *Myosotis.*
Corolla-lobes imbricate in the bud.
Nutlets 2, each commonly 2-celled; anthers sagittate with the auricles usually appendaged; rather rank herbs with broad deeply cordate sessile leaves.....20. *Cerinthe.*
Nutlets usually 4, these normally 1-celled; anthers not sagittate nor appendaged; leaves not cordate.
Fruiting calyx strongly accrescent, very veiny, irregularly toothed and lobed, plicate.....21. *Asperugo.*
Fruiting calyx moderately accrescent if at all, not conspicuously veiny nor irregularly toothed or lobed, never plicate.
Cotyledons 2-lobed; corollas unappendaged, orange or yellow.....22. *Amsinckia.*

Cotyledons unlobed; corollas almost always appendaged, white or blue or very rarely even yellowish.
Shrub 9–18 dm. high; nutlets broadly attached anteriorly for nearly their whole length, margin lacerate, dorsum with glochidiate appendages.....23. *Selkirkia.*
Herbaceous or rarely suffrutescent plants, less than 9 dm. high.
Nutlets with a definite medial ventral groove formed by the non-fusion of the pericarpial walls.....24. *Cryptantha.*
25. *Oreocarya.*
Nutlets with the pericarpial walls fused at least above the middle and commonly forming a medial ventral keel.
Dorsum of nutlets not encircled by an up-turned rim or flange, almost always without glochidiate appendages.
Corolla white, throat very short and shallow, tube exceeded by or rarely just exceeding calyx; nutlets usually with a medial dorsal keel; style usually shorter than nutlets.....26. *Plagiobothrys.*
Corolla blue, throat cylindrical or funnelform, tube usually much surpassing calyx; nutlets usually lacking a medial dorsal keel; style usually greatly exceeding nutlets..27. *Mertensia.*
Dorsum of nutlets encircled by an up-turned rim or flange which is usually toothed or lacerate, commonly with uncinate hairs or glochidiate appendages.
Gynobase flat; nutlets definitely tetrahedral, attached basally (at apex of inverted tetrahedron) or through a suprabasal substipitate prolongation.....28. *Trigonotis.*
Gynobase pyramidal or subulate; nutlets not at all tetrahedral, attached ventrally.
Nutlets equalling the subulate gynobase, attached for nearly their whole length along the ventral keel, lacking a definite areola; style usually surpassing nutlets; bracteate annuals.....29. *Lappula.*
Nutlets twice surpassing the stout pyramidal gynobase, attached obliquely supramedially by a deltoid or ovate areola; style exceeded by nutlets; usually ebracteate; perennials or biennials.

Fruiting calyces erect or ascending; low densely caespitose silky-pubescent plants with small firm leaves.....30. *Eritrichium.*
Fruiting calyces reflexed; rank tufted glabrous or sparsely pubescent plants with broad herbaceous leaves.....31. *Hackelia.*

1. **Borago** [Tourn.] L. Sp. Pl. 137 (1753); Gen. Pl. 67 (1754).

Borago officinalis L. Sp. Pl. 137 (1753).—Native of the Mediterranean region. Introduced in N. S., Me.!, N. H.!, Mass.!, Conn., N. Y., Penn., D. C., Va., Ont., Tenn., Ill.!, O., Mich., Wis., N. D., Ore., B. C., Vera Cruz!, Jalisco, Nicaragua, Ecuador, Bolivia!, Chile, Uruguay, Argentina.

2. **Nonea** Medik. Phil. Bot. i. 31 (1789).

KEY TO SPECIES.

Nutlets apparently attached on side, longer than tall, with the strongly defined coarse annular basal rim papillose-dentate on margin.....1. *N. vesicaria*
Nutlets apparently attached at or near the base, evidently taller than broad, with the annular basal portion weakly developed and not papillose-dentate.
Nutlets brown, nearly vertical, only slightly oblique, subterete, very obscurely rugose, greatest breadth ca. ⅔ height; plant commonly branched only near base; corolla usually yellow.....2. *N. lutea.*
Nutlets plumbeous, strictly ascending, strongly oblique, compressed, conspicuously rugose, greatest breadth nearly equalling height; plant branched above; corolla rose-colored at least upon opening.....3. *N. rosea.*

1. **Nonea vesicaria** (L.) Reichenb. Fl. Germ. Excur. i. 338 (1831). *Lycopsis vesicaria* L. Sp. Pl. 138 (1753). *Echioides nigricans* Desf. Fl. Atl. i. 163 (1798–1800). *N. nigricans* DC. Fl. Fr. iii. 626 (1805).—Native of the western Mediterranean region. Reported, Mem. N. Y. Bot. Gard. v. 525 (1915), as adventive in the vicinity of New York.

2. **N. lutea** (Desr.) DC. Fl. Fr. iii. 626 (1805); Bornmüller, Bull. Herb. Boiss. ser. 2, vii. 780 (1907). *Lycopsis lutea* Desr. in Lam. Dict. iii. 657 (1791). *L. ciliata* Willd. Sp. Pl. i. 780 (1797). *N. ciliata* DC. l. c. *L. setosa* Lehm. Asperif. ii. 269 (1818). *N. setosa* R. & S. Syst. iv. 754 (1819).—Native of southeastern Europe and adjacent Asia. Occasionally introduced in impure seed. Known from Penn.!, Ky.!, and N. Y.!

3. **N. rosea** (Marschall) Link, Enum. i. 167 (1821). *Anchusa rosea* Marschall, Fl. Taur.-Cauc. i. 125 (1808).—Native of southeastern Europe. Collected in a waste place at Bangor, Me., in 1902 by O. W. Knight.

3. **Symphytum** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

Key to Species.

Stems and inflorescence covered with short recurved thornlet- or prickle-like hairs; tip of corolla-lobes erect. . . . . 1. *S. asperum.*
Stems and inflorescence glabrate or sometimes hirsute, but pubescence not recurved and prickle-like; tips of corolla-lobes recurved.
Leaves conspicuously decurrent; root branched, fusiform, without tuberous thickenings; nutlets lustrous, smooth, almost lacking the annular thickened base; base entire. . . 2. *S. officinale.*
Leaves not decurrent or very obscurely so; root horizontal with tuberous thickenings; nutlets dull, finely tuberculate, with an annulate toothed base. . . . . 3. *S. tuberosum.*

1. **Symphytum asperum** Lepechin, Nov. Act. Acad. Petrop. xiv. 444, t. 7 (1805); Bucknall, Jour. Linn. Soc. xli. 510 (1913); Macbr. Rhodora xviii. 23 (1916). *S. asperrimum* Donn, Bot. Mag. xxiv. t. 929 (1806).—Native of the Caucasus region of southeastern Europe and adjacent Asia. Introduced in P. E. I.!, Que.!, N. S.!, N. B.!, Me.!, Vt.!, Conn.!, Mass.!, N. Y.!, Md., Mich.!, Wash.!, B. C.

2. **S. officinale** L. Sp. Pl. 136 (1753).—Native of temperate Europe. Introduced in Newf.!, Que., N. S.!, Me.!, N. H.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, Md., Del., D. C., W. Va., Va.!, N. C.!, Tenn., Ky., O., Ont., Wis., Ind., Mich., Minn., Wis., Mo., Mont., La.

3. **S. tuberosum** L. Sp. Pl. 136 (1753).—Native of middle and southern Europe. Known in America only from Connecticut where reported from Southington! and Guilford.

4. **Lycopsis** L. Sp. Pl. 138 (1753); Gen. Pl. 68 (1754).

Lycopsis arvensis L. Sp. Pl. 139 (1753).—Native of temperate Europe. Introduced in Que.!, N. B.!, N. S., Me.!, Mass.!, R. I.!, N. Y.!, Penn.!, Va., D. C., O., Ont., Minn., Colo., Calif.!, Chile.

5. **Anchusa** L. Sp. Pl. 133 (1753); Gen. Pl. 64 (1754).

Key to Species.

Nutlets erect, oblongish, nearly twice as tall as thick; calyx cut to near base, 7–15 mm. long, lobes narrowly linear-acuminate; corolla with limb 12–20 mm. broad, appendages densely penicillate; bracts linear-lanceolate, simulating calyx-lobes. . . . . 1. *A. azurea.*
Nutlets horizontal, somewhat ovoid, less tall than long; calyx cut to near middle or below, 5–7 mm. long, lobes deltoid to lanceolate; corolla with limb 5–10 mm. broad, appendages entirely pubescent.

Nutlets 1.5 mm. high, 2.2 mm. long; calyx-lobes deltoid, evidently shorter than tube, tube frequently bladdery-inflated in advanced fruiting; bracts linear to narrowly lanceolate; cauline leaves 3–8 or exceptionally 13 mm. broad; inflorescence usually a cylindrical panicle; fruiting racemes 2–5 cm. long.....2. *A. capensis.*

Nutlets 2 mm. high, 3 mm. long; calyx-lobes lanceolate or narrowly triangular, about equalling tube, tube never bladdery-inflated; bracts ovate or oblong; cauline leaves 8–25 mm. broad; inflorescence various; fruiting racemes 6–12 cm. long.....3. *A. officinalis*

1. **Anchusa azurea** Mill. Gard. Dict. ed. 8, n. 9 (1768); Schinz & Thell. Vierteljahrs. Naturf. Ges. Zürich liii. 557 (1908). *A. italica* Retz. Obs. Bot. i. 12 (1779.) *A. paniculata* Aiton, Hort. Kew i. 177 (1789). *Buglossum elatum* Moench, Meth. 418 (1794).—Native of the Mediterranean region. Material from Granby, Conn., and Salem, Ore., has been examined. It has been reported, Rhodora xxv. 28 (1923), from East Boston.

2. **A. capensis** Thunb. Prodr. Pl. Cap. 34 (1794).—Native of South Africa. Occasionally cultivated; occurring as an escape at Salem, Ore.

3. **A. officinalis** L. Sp. Pl. 133 (1753). *A. angustifolia* L. l. c.; Schinz & Thell. Viertljahrs. Naturf. Ges. Zürich liii. 557 (1908). *A. officinalis*, var. *angustifolia* DC. Prodr. x. 43 (1846); Macbr. Rhodora xviii. 51 (1916). *A. arvalis* Reichenb. Fl. Germ. Excur. 343 (1831).—Native of temperate Europe and of Asia Minor. Introduced in Me.!, Mass.!, R. I.!, Conn.!, N. Y., N. J.!, O., Ut., Colo., Argentina. Attempts have been made to distinguish the var. *angustifolia* among the immigrant plants of *A. officinalis*. The variety, however, seems too unimportant and vague to warrant its recognition among the introduced material. "*A. leptophylla* Roem. & Schult." is reported as a waif in the vicinity of New York by Taylor, Mem. N. Y. Bot. Gard. v. 525 (1915). The record may be based on a form of *A. officinalis* L. since Boissier, Fl. Orient. iv. 154 (1875), suggests that Roemer & Schultes's species may be only a narrow-leaved phase of *A. officinalis*.

6. **Echium** [Tourn.] L. Sp. Pl. 139 (1753); Gen. Pl. 68 (1754).

KEY TO SPECIES.

Basal leaves ovate or broadly oblong, secondary nervation manifest; upper leaves narrowed from a broad cordate subamplexicaul base; corolla of a delicate texture, glabrous or but sparsely setose.....1. *E. plantagineum.*

Basal leaves oblanceolate, secondary nervation obscure; upper leaves not cordate nor subamplexicaul; corolla of rather firm texture and usually pubescent as well as setose.

Stamens very unequal, a pair conspicuously exserted and a shorter one subincluded; plants with an obscured central axis, the long branches rebranched.....2. *E. Coincyanum.*
Stamens in two subequal exserted pairs; plants branched at base, central axis definite, with its laterals short and almost invariably unbranched.
Inflorescence a close narrow elongate thyrse 3–7 cm. thick; when present the slender spreading hairs on the herbage with inconspicuous or no pustulate bases.....3. *E. vulgare.*
Inflorescence a very loose broad thyrse 7–30 cm. thick; herbage usually with very conspicuous pustulate bases to the very coarse spreading hairs.....3a. *E. v. pustulatum.*

1. **Echium plantagineum** L. Mant. Alt. 202 (1771); Coincy, Jour. de Bot. xiv. 328 (1900); Lacaita, Jour. Linn. Soc. xliv. 420 (1919). *E. violaceum* of authors, not L. (1767); Coincy, l. c.; Lacaita, l. c. 423. *E. bonariensis* Poir. Encyc. viii. 674 (1808).—Native of the Mediterranean region and the Near East. At an early date introduced into South America where now widely distributed over the states of Buenos Aires and Entrerios in Argentina, over all of Uruguay, and over parts of extreme southern Brazil. In North America reported merely as adventive in the vicinity of New York City.

2. **E. Coincyanum** Lacaita, Jour. Linn. Soc. xliv. 374 (1819). *E. australe* of Coincy, Jour. de Bot. xiv. 326 (1900), and Rouy & Fouc. Fl. Fr. x. 309 (1908).—Native of the Spanish peninsula. Only two American collections have been seen, one made at Farmington, Me., in 1882 by Keyes, and the other made near Cambridge, Mass., in 1913 by Fernald & Long. The latter collection has the corollas merely setose and may not be correctly determined.

3. **E. vulgare** L. Sp. Pl. 139 (1753); Lacaita, Jour. Linn. Soc. xliv. 426 (1919).—Native of Europe. Long ago introduced into eastern United States and now a serious pest in the New England and Middle Atlantic states. Known from Que.!, N. S.!, N. B.!, Me.!, N. H.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, N. J., Penn.!, Del., Md., Va.!, W. Va.!, D. C.!, N. C., Ga., Ont.!, O., Ind.!, Ill.!, Ky., Tenn., Wis., Mich., Iowa, Mo.!, Neb., S. D., Kan., La., Texas, N. M. Reported from Chile by Reiche, Fl. Chile v. 240 (1910).

3a. **E. vulgare**, var. **pustulatum** (Sibth. & Sm.) Coincy, Jour. de Bot. xiv. 301 and 303 (1900). *E. pustulatum* Sibth. & Sm. Fl. Graec. ii. 68, t. 180 (1813); Lacaita, Jour. Linn. Soc. xliv. 386 (1919).—Native of the Mediterranean region. Adventive in America and known only from N. J.!, Penn.!, D. C.?, and W. Va.! Old mutilated plants of the typical phase of *E. vulgare* frequently take on the loosely branched habit of this variety, but should not be confused with it

7. **Moritzia** DC. in Meisn. Genera i. 280; ii. 188 (1840).

Meratia A. DC. Prodr. x. 104 (1846).

KEY TO SPECIES.

Nutlets smooth; style 5–7 mm. long, greatly surpassing fruit as well as corolla; corolla-tube ca. 5 mm. long, clearly exceeding calyx; corolla-lobes oblong-deltoid; corolla-appendages ligulate, protruded; inflorescence shaggy-pubescent; calyces all sessile.....1. *M. ciliata.*

Nutlets muriculate; style 1–2 mm. long, surpassed by nutlets; corolla-tube ca. 2 mm. long, equalling or slightly exceeded by the calyx; corolla-lobes semicircular to short-ovate; corolla-appendages represented merely by circular bearded areas, not ligulate nor protruded; inflorescence short-strigose; lowermost calyces with pedicels.....2. *M. Lindenii.*

1. **Moritzia ciliata** (Cham.) DC. in Meisn. Genera ii. 188 (1840); Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63, t. 10, fig. 13 (1857); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3, 121, fig. 47l and 47m (1893). *Anchusa ciliata* Cham. Linnaea iv. 440 (1829). *M. ciliata*, var. *hirsuta* Fresen. l. c.—BRAZIL: Porto Alegre, *Reineck* (G); Prov. Rio Grande do Sul, 1897, *Reineck & Czermak 1* (US); without locality, *Sellow 672* (US, ISOTYPE of *A. ciliata* Cham.).—The species is known positively only from extreme southern Brazil.

2. **M. Lindenii** (A. DC.) Benth. acc. Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3, 121 (1897). *Meratia Lindenii* A. DC. Prodr. x. 104 (1846).—COLOMBIA: wet mossy paramo, Paramo de Cruz Verde, near Bogotá, alt. 3300–3500 m., *Pennell 2052* (US, NY, G); moist grassy paramo, alt. 3400–3700 m., Cerro Tatama, Dept. of Caldas, *Pennell 10576* (G); forest below Paramo del Quindio, alt. 3500–3800 m., Dept. of Caldas, *Pennell & Hazen 10078* (G). VENEZUELA: Paramo de la Sal, Mérida, 3400 m., *Jahn 515, 592* (US).—The type of this very distinct species is given as having come from Carácas, Venezuela. Although Gürke attributes the accepted combination to Bentham, the latter appears to have done no more than indicate in the Genera Plantarum, ii. 859 (1876), that *Meratia* was synonymous with *Moritzia.*

8. **Thaumatocaryon** Baill. Bull. Mens. Soc. Linn. Paris 839 (1890).

KEY TO SPECIES.

Leaves opposite throughout the plant; nutlets smooth and shiny.

Cauline leaves ovate or narrowly ovate-oval, base somewhat cordate.....1. *T. Hilarii.*

Cauline leaves lance-oblong to ovate-oblong, base rounded.

2. *T. tetraquetrum.*

Leaves alternate throughout the plant; nutlets (at least in no. 4) muricate and dull.
Anthers conspicuously exceeded by length of filaments; plants somewhat hispid, harsh to touch; lowermost leaves conspicuously developed, 10–15 cm. long, 25–45 mm. broad; corolla ca. 5 mm. long.....3. *T. dasyanthum.*
Anthers and filaments about equally long; plants evenly strigose, smoothish; lowermost leaves not well developed, 3–7 cm. long, 8–18 mm. broad; corolla ca. 4 mm. long.
4. *T. Sellowianum.*

1. **Thaumatocaryon Hilarii** Baill. Bull. Mens. Soc. Linn. Paris 839 (1890). *Antiphytum Bornmülleri* Pilger in Fedde, Repert. iii. 24 (1906). *A. Bornmülleri*, var. *asperior* Pilger, l. c. 25.—This species is known to me only through descriptions, and it is with much doubt that I accord it full recognition. According to Pilger, l. c., it differs from *T. tetraquetrum* in its broader leaves, thicker shorter inflorescence, and smaller calyx-lobes. The Saint-Hilaire and the Bornmüller material comes from Rio Grande do Sul, Brazil.

2. **T. tetraquetrum** (Cham.), comb. nov. *Anchusa tetraquetra* Cham. Linnaea viii. 113 (1833). *Antiphytum tetraquetrum* DC. Prodr. x. 122 (1846).—Brazil: without locality, *Sellow* (isotype, US). Paraguay: Alto Paraná, *Fiebrig 5885, 6131* (G, US); "Sierra de Maracayú," *Hassler 5231* (G).—All precisely labeled material comes from eastern Paraguay and seems to be exactly matched by isotypic material. It is not improbable that Sellow's original collection came from outside the present limits of Brazil. This species has been almost universally regarded as a member of *Antiphytum*, being so treated in my recent revision of that genus, Contr. Gray Herb. n. s. lxviii. 51 (1923). The species, however, is a rank-growing broad-leaved herb with a tubular calyx that permanently encloses the single nutlet matured. These developments are not known in the other species of *Antiphytum*, but they do occur in and characterize *Moritzia* and *Thaumatocaryon*. It is hence with considerable confidence that I now transfer the species from *Antiphytum*.

3. **T. dasyanthum** (Cham.), comb. nov. *Anchusa dasyantha* Cham. Linnaea iv. 437 (1829). *Moritzia dasyantha* Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63 (1857).—Brazil: without locality, *Sellow 7964* (isotype, US).—A mature collection of this species is greatly needed, as the only available material is a duplicate of the original collection and like it lacks fruit. Until mature fruit is available the status of the species is somewhat problematic. It seems most nearly related to *T. Sellowianum*, but is a coarser plant with longer pubescence and larger corollas.

4. **T. Sellowianum** (Cham.), comb. nov. *Anchusa Sellowiana* Cham. Linnaea iii. 115 (1833). *Moritzia Sellowiana* Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63, fig. 14 (1851).—Brazil: without locality, *Sellow* (isotype, US).

9. **Macromeria** Don, Edinb. New Philos. Jour. xiii. 239 (1832).

Philonomia DC. in Steud. Nom. ed. 2, ii. 320 (1841).

Key to Species.

Corolla with lobes reflexed or recurved at least during pollination, evidently irregular, limb oblique, throat somewhat distorted abaxially in the bud. § *Eumacromeria.*
Filaments 3–6 cm. long, about twice length of corolla-lobes, excessively exserted and conspicuous; corolla very large, 7–8 cm. long; lower leaves obovate; anthers linear-arcuate, 3–3.5 mm. long.....1. *M. exserta.*
Filaments ca. 1 cm. long, about equalling or a trifle exceeding corolla-lobes, not strikingly and conspicuously exserted; corolla medium-sized, 4–5.5 cm. long; lower leaves lanceolate; anthers straight, oblong, 2–2.5 mm. long.....2. *M. hispida.*
Corolla with lobes erect or ascending and never reflexed or recurved, practically regular, limb not oblique and throat without any abaxial distortion. § *Macromerioides.*
Stems conspicuously hirsute; anthers linear 3–4 mm. long, attached between the base and middle, usually erect...3. *M. longiflora.*
Stems closely short-strigose; anthers oblong or linear-oblong, 2–3 mm. long, attached just below the middle, subversatile.
Upper surface of leaves merely scabrous, without hairs or pustules.....4. *M. discolor.*
Upper surface of leaves not only scabrous but also strigose or somewhat pustulate.
Corolla 4–4.5 mm. long, appressed silky-villous outside; Mexican.....5. *M. Pringlei.*
Corolla ca. 2.5 mm. long, tomentose outside; Peruvian.
6. *M. cinerascens.*

1. **Macromeria exserta** Don, Edinb. New Philos. Jour. xiii. 239 (1832); Bot. Reg. xxxiii. t. 26 (1847). *Echium longiflorum* Sesse & Moc. Pl. N. Hisp. 20 (1887).—Mountainous portions of southwestern Mexico from Jalisco to Oaxaca. Most abundant on the Pacific slope of Oaxaca or at least most collected there. This species is readily distinguished by its very coarse habit, obovate lower leaves, and its very large showy somewhat irregular corollas with enormously exserted stamens. Its corollas are the largest in the family. The plants are usually abundantly shaggy-hirsute on the stems, but in *M. exserta,* var. *imparata* Macbr., Contr. Gray Herb. n. s. xlix. 22 (1917), the stems are closely short-strigose.

2. **M. hispida** Mart. & Gal. Bull. Acad. Brux. xi. 339 (1844). *M. longiflora,* var. *hispida* A. DC. Prodr. x. 68 (1846). *Onosmodium*

longiflorum, var. *hispidum* Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917). *M. longiflora* of A. DC. l. c., not of Don (1832).—Known only from Michoacan.

3. **M. longiflora** (Sesse & Moc.) Don, Edinb. New Philos. Jour. xiii. 239 (1832). *Lithospermum longiflorum* Sesse & Moc. Fl. Mex. 29 (1894). *Onosmodium longiflorum* Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917). *M. viridiflora* DC. Prodr. x. 68 (1846); Moc. & Sesse, Calq. Fl. Mex. t. 904 (1874). *O. Thurberi* Gray, Synop. Fl. N. Am. ii. pt. 1, 205 (1878). *M. Thurberi* Mack. Bull. Torr. Bot. Cl. xxxii. 496 (1905).—Middle and southern New Mexico and Arizona, southward into Chihuahua and Sonora. *Macromeria viridiflora* DC. is based upon a Sesse & Mociño plate which evidently pictures the species which Gray called *O. Thurberi*, the drawing and Gray's type agreeing in possessing such distinctive characters as spreading pubescence on leaves and stems, leaves with numerous veins, very pubescent corollas with erect greenish lobes, and stamens that just equal or barely surpass the corolla-tube. *Macromeria longiflora* Don, was based upon "*Lithospermum longiflorum*, Sesse et Mocino, mss. in herb. Lamb." The description of *L. longiflorum* by Mociño & Sesse, Fl. Mex. 29, applies to the plant figured in their plates, and their species is hence a synonym of *M. viridiflora* DC. *Macromeria longiflora* Don was based upon material labeled by Mociño & Sesse, but the exceedingly short description written by Don gives the leaves as "smoothish" whereas in *M. Thurberi* and in the Mociño & Sesse plates they are notably rough. There is, hence, a possibility that Don's plant is different from the one described and figured by Mociño & Sesse. In their flora the latter authors give the type locality of *L. longiflorum* as "ad oppidum S. Rosae prope Guanaxuatum." This station could scarcely be within the present state of Guanajuato since the plant they illustrate and describe belongs to a northern species not known south of the southern boundary of Chihuahua. I suspect that the type was collected in southeastern Sonora where they are known to have collected within the range of the species treated.

4. **M. discolor** Benth. Pl. Hartw. 49 (1840). *Onosmodium discolor* Macbr. Contr. Gray Herb. n. s. xlix. 20 (1917).—Southern Jalisco southward into Oaxaca. Readily recognized by its glabrous, yet scabrous, upper leaf-surfaces which dry a rich chocolate brown.

5. **M. Pringlei** Greenm. Proc. Am. Acad. xxxiv. 570 (1899). *Onosmodium Pringlei* Macbr. Contr. Gray Herb. n. s. xlix. 20 (1917).—Known only from the Sierra Pachuca in Hidalgo.

5. **M. cinerascens** A. DC. Prodr. x. 69 (1846).—Known to me only from descriptions and perhaps improperly referred to *Macromeria*. The type came from Chachapoyas, Peru.

10. **Lasiarrhenum**, gen. nov.

Calyx 5-partitus, segmentis linearibus. Corolla tubulosa, recta, fauce nuda; lobi 5, erecti, breves, rotundi vel obtusi. Stamina 5, conniventia, tubo affixa, inclusa, filamentis brevibus ligulatis; antherae compresse fusiformes, dorso hirsutissimae, loculis subdistinctis, connectivo conspicue producto acuminato. Ovarii lobi 4, distincti, erecti, subglobosi, gynobasi planae impositi. Stylus filiformis, tarde (non praecociter) exsertus; stigmatibus 2 cohaerentibus parvis. Nuculae 1–4, erectae, nitidae, albae, areola plana gynobasi planae affixae. Semina recta, cotyledones planae.—Herbae mexicanae erectae perennes rudes hirsutae et scabrae. Folia alterna, venis primariis valde elevatis. Racemi terminalis rami scorpioidei bracteati primum densi deinde elongati dissitiflori. Flores pedicellati albi vel incarnati. (Name from λάσιος, *hairy*, and ἄρρην, *male*, with reference to the hirsute anthers.)

Lasiarrhenum strigosum (HBK.), comb. nov. *Onosma strigosum* HBK. Nov. Gen. et Sp. iii. 93 (1818). *Onosmodium strigosum* Don, Gen. Syst. iv. 317 (1837). *Onosma trinervium* Lehm. Asperif. ii. 378 (1818); Icones i. 11, t. 9 (1821). *Lithospermum longifolium* Willd. in R. & S. Syst. iv. 742 (1819).—Pacific slope of southern Mexico from Jalisco to Oaxaca.

This species has been usually taken as a member of the genus *Onosmodium*, but its reference there destroys the homogeneity of that genus and leaves the latter almost characterless, whereas its removal as a distinct genus allows *Onosmodium* and all its immediate relatives to be sharply and very naturally defined. As an alternative to the above proposal, the genera *Onosmodium* and *Macromeria* might be submerged in *Lithospermum*. This latter proposal seems quite unwise, however, since it would bring under a single genus a great diversity of corolla-structures, thereby setting a new and much lower value upon them in the classification of the tribe *Lithospermeae* and causing far reaching readjustments among the very numerous Old World members of the alliance.

The genus *Lasiarrhenum* is most nearly allied to *Onosmodium*, that genus being taken as defined by Mackenzie, Bull. Torr. Bot. Cl. xxxii. 495–6 (1905). *Lasiarrhenum* agrees with its relative in having sagittate anthers and cylindrical corollas with erect lobes, but differs

in having rounded corolla-lobes, ligulate filaments, large hirsute anthers, and shortly and tardily protruded styles. *Onosmodium* is a very natural genus characterized by its tubular corolla with erect acute or acuminate lobes, short narrow filaments, narrowly sagittate glabrous anthers, and precociously long protruded style that is exserted before the corolla is even a third open.

Macbride, Contr. Gray Herb. n. s. xlix. 19–21 (1917), has recently amplified *Onosmodium* so as to include in it the majority of the species usually referred to *Macromeria* and restricted the latter genus to *M. exserta*. With this arrangement I am unable to agree, since it destroys the homogeneity of *Onosmodium* and obscures its characters, and since it separates generically such obviously related species as *M. exserta* and *M. hispida* because of fruit-characters of very dubious phylogenetic significance. *Macromeria*, as defined by De Candolle, Prodr. x. 68–9 (1846), is a very satisfactory and natural genus characterized by its exceptionally large usually trumpet-shaped occasionally irregular corollas with ascending or recurved ovate or oblongish usually acute lobes, very long filiform filaments that just exceed or very conspicuously surpass the throat of the corolla, oblong obtuse anthers, and tardily protruded style. The genus has the acute corolla-lobes of *Onosmodium*, but that is the only character which suggests a relation with the latter genus rather than with *Lithospermum*, the genus which seems to be its closest relation. *Onosmodium* differs from *Lithospermum* in its protruded stamens and large corollas with acutish lobes. *Lasiarrhenum* differs from *Macromeria* in its smaller cylindrical corollas with erect rounded lobes, ligulate included filaments, and sagittate hirsute anthers.

Lithospermum is a large and variable genus characterized by its ascending or divergent or recurved rounded or obtuse corolla-lobes, oblong included anthers, and style that is tardily and but little if at all exserted. It is also to be recognized by the frequent occurrence in its species of veinless leaves and obviously geminate styles, the species of *Macromeria*, *Onosmodium*, and *Lasiarrhenum* always having prominently veined leaves and obscurely geminate styles. In *Lithospermum* the corolla is extremely variable in size and form, though constant in the position and shape of its lobes. Faucal appendages have various developments, and among the species of Lithosperms all stages can be found between conspicuous intruded ligulate structures and mere downy spots or naked fauces. The genus is readily separated from *Lasiarrhenum* by its non-erect corolla-lobes, oblong glabrous anthers, and slender filiform filaments.

11. **Onosmodium** Michx. Fl. Bor. Am. i. 132 (1803).

Osmodium Raf. Med. Repos. N. Y. v. 350 or 352 (1808); Am. Mo. Mag. ii. 176 (1818); Am. Mo. Mag. iv. 191 (1819). *Purshia* Spreng. Anleit. ed. 2, ii. 450 (1817). *Onosmidium* Walp. Ann. iii. 134 (1853).

Key to Species.

Corolla a clear light- or orange-yellow; lobes narrowly lanceolate-acuminate, 2–3 times as long as broad.....1. *O. virginianum.*
Corolla sordid or greenish-white or merely yellowish; lobes triangular-acute or -acuminate, little longer than wide.
Corolla lobes more or less acuminate.
Fruiting pedicels well developed, 8–15 mm. long; bracts ovate, obtusish; corolla-lobes about as long as tube, 8–10 mm. long.....2. *O. Helleri.*
Fruiting pedicels not greatly elongated, 1–8 mm. long; bracts lanceolate or ovate-lanceolate, acute; corolla-lobes about half as long as tube.
Stems conspicuously long spreading hirsute; corolla-lobes glabrate or pubescent down the middle; Texan..3. *O. bejariense.*
Stems short appressed villous; corolla-lobes pubescent over most of outer surface; Mexican.....4. *O. unicum.*
Corolla lobes merely acute.
Stems smooth glabrous and usually shiny below.....5. *O. subsetosum.*
Stems roughly pubescent and dull throughout.
Nutlets strongly constricted at the base; plant always coarsely spreading hirsute.....6. *O. hispidissimum.*
Nutlets with base rounded or if weakly constricted the plant somewhat silky hirsute.....7. *O. molle.*

1. **Onosmodium virginianum** (L.) A. DC. Prodr. x. 70 (1846). *Lithospermum virginianum* L. Sp. Pl. 132 (1753). *O. hispidum* Michx. Fl. Bor. Am. i. 133 (1803). *Purshia hispida* Lehm. Asperif. ii. 382 (1818). *O. scabrum* R. & S. Syst. iv. 57 (1819). *P. scabra* Nutt. Trans. Am. Philos. Soc. v. 189 (1837). (?) *O. nigrum* Raf. Atl. Jour. i. 148 (1832). *O. virginianum*, var. *hirsutum* Mack. Bull. Torr. Bot. Cl. xxxii. 499 (1905).—Connecticut to Florida, and westward along the Gulf to Louisiana. The southern material is frequently spreading hirsute and has been called the variety *hirsutum*.

2. **O. Helleri** Small, Fl. Southeast. U. S. 1000 (1903); Mack. Bull. Torr. Bot. Cl. xxxii. 497 (1905); Schulz, Wild Fl. San Antonio 176 (1922).—Known only from Texas. I have seen no flowers of this species, the floral characters used in the key having been derived from Schulz's, l. c., account of the species.

3. **O. bejariense** DC. Prodr. x. 70 (1846); Mack. Bull. Torr. Bot. Cl. xxxii. 505 (1905).—Known only from Texas.

4. **O. unicum** Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917).—Known to me only from the type collection made at Alvarez, San Luis

Potosi. The plant is scarcely more than a pubescent geographic form of *O. bejariense* and perhaps does not merit specific rank.

5. **O. subsetosum** Mack. & Bush in Small, Fl. Southeast. U. S. 1001 (1903); Mack. Bull. Torr. Bot. Cl. xxxii. 505 (1905).—Missouri and Arkansas.

6. **O. hispidissimum** Mack. Bull. Torr. Bot. Cl. xxxii. 500 (1905). *O. hispidissimum*, var. *macrospermum* Mack. l. c. 502.—New York to Maryland, and westward to Louisiana, Texas, and Nebraska.

7. **O. molle** Michx. Fl. Am. Bor. i. 133, t. 15 (1803); Mack. Bull. Torr. Bot. Cl. xxxii. 499 (1905). *Lithospermum molle* Muhl. Cat. 19 (1813). *Purshia mollis* Lehm. Asperif. ii. 383 (1818). *O. cariolinianum*, var. *molle* Gray, Synop. Fl. N. A. ii, pt. 1, 206 (1878).—In its extreme form known only from the vicinity of Nashville, Tenn.

7a. **O. molle**, var. **occidentale** (Mack.), comb. nov. *O. occidentale* Mack. Bull. Torr. Bot. Cl. xxxii. 502 (1905). *O. occidentale*, var. *sylvestre* Mack. l. c. 504.—Minnesota and Illinois, westward to Texas, New Mexico, Utah, and Saskatchewan. This is the common *Onosmodium* west of the Mississippi River. The plant is not accorded specific rank due to the material from Illinois which shows repeated tendencies to intergrade with *O. molle*. The variety usually differs from the typical form of the species in its coarser stems, rough spreading pubescence, larger calyces (8–12 mm. long), and unpitted non-constricted nutlets, but these characters and their complements occur in various combinations in the collections from Illinois.

12. **Lithospermum** L. Sp. Pl. 132 (1753); Gen. Pl. 64 (1754).

Batschia Gmel. Syst. ii. 315 (1791). *Cyphorima* Raf. Jour. Phys. lxxxix. 98 (1819); Am. Mo. Mag. iv. 191 and 357 (1819). *Pentalophus* A. DC. Prodr. x. 86 (1846).

KEY TO SPECIES.

Plant evidently annual.
- Nutlets dull, densely tuberculate; calyx not cut to base.....1. *L. arvense.*
- Nutlets glossy, not tuberculate; calyx divided.
  - Leaves obtuse; fruiting calyx 3–5 mm. long; corolla 4–5 mm. long, tube ca. 2 mm. long; nutlets pitted.....2. *L. matamorense.*
  - Leaves acute; fruiting calyx 8–11 mm. long; corolla ca. 7 mm. long, tube ca. 5 mm. long; nutlets smooth....3. *L. Pringlei.*

Plants perennial or rarely biennial.
- Corolla definitely strigose inside.
  - Middle cauline leaves veinless, usually rounded or obtuse, commonly broadest above the middle, two surfaces weakly contrasted, both more or less sparsely strigose and the lower somewhat glaucous as well; basal leaves in a rosette; corolla yellow.....4. *L. lasiosiphon.*

Middle cauline leaves evidently veined, acute, broadest at or below the middle, two surfaces strongly contrasted, the upper green and glabrous, the lower canescent and densely strigose or tomentose; basal leaves not persistent at anthesis; corolla white.
Plant somewhat suffrutescent, very loosely branched; leaves thick, veins deeply impressed on upper surface; middle cauline leaves 1–2 cm. broad.....5. *L. discolor*.
Plants herbaceous, a little branched above; leaves not noticeably thick, veining not impressed on upper surface; middle cauline leaves 1.5–2.5 cm. broad..6. *L. hypoleucum*.
Corolla glabrate inside or merely with a hirsute ring at base.
Corolla definitely white.
Tube 12–14 mm. long, limb 10-16 mm. broad.....7. *L. Nelsonii*.
Tube 2–8 mm. long, limb 5–12 mm. broad.
Calyx-lobes ovate or oblong, not exceeding nutlets; plants low, decumbent or ascending, with a compact woody caudex; high altitudes in Peru..8. *L. peruvianum*.
Calyx-lobes linear, surpassing the nutlets; plants erect or ascending, lacking an evident compact woody caudex; middle altitudes in eastern Mexico..9. *L. distichum*.
Corolla yellow or yellowish.
Nutlets rugose-tuberculate.....10. *L. mirabile*.
Nutlets smooth or merely pitted
Corolla salverform, limb 9–18 mm. broad, lobes commonly fimbriate, tube slender, elongate, 15–33 mm. long, 1–3 mm. thick; later flowers cleistogamous, abundantly fructiferous, in fruit usually with recurved pedicels.....11. *L. angustifolium*.
Corolla various but if slenderly elongate-salverform the limb 2–7 mm. broad and lobes never fimbriate; flowers never cleistogamous; fruiting pedicels (except in no. 32) always erect.
Basal leaves persistent and forming a rosette at anthesis.
Plant with a short main root and numerous tuberous-thickened rootlets; cauline leaves ovate to obovate-oblong, 1–2 cm. broad; corolla 3–4 mm. broad, lobes erect.....12. *L. tuberosum*.
Plant with a scarcely branched tap-root; cauline leaves somewhat linear, 2–5 mm. broad; corolla 9–18 mm. broad, lobes spreading.
Radical leaves linear to oblanceolate, 8–13 mm. broad.....13. *L. cobrense*.
Radical leaves obovate, 15–23 mm. broad...14. *L. obovatum*.
Basal leaves lacking at anthesis.
Corolla inconspicuous, 4 mm. long or less or with tube clearly not exceeding the length of calyx-lobes.
Leaves herbaceous, veining evident.
Leaves 20–45 mm. broad, ovate-lanceolate; nutlets 28–35 mm. long; pubescence closely appressed.....15. *L. latifolium*.
Leaves 6–15 (–23) mm. broad, lanceolate; nutlets 20–28 mm. long; pubescence loosely appressed or somewhat spreading
16. *L. officinale*.

Leaves firm, apparently veinless.
Flowers in a very leafy cylindrical thryse, scattered along rather numerous short spreading branches.....27. *L. ruderale.*
Flowers racemose or disposed along several corymbose branches; inflorescence not conspicuously leafy.
Fruiting calyx short, lobes about twice length of nutlets.....17. *L. calcicola.*
Fruiting calyx long, lobes 3–5 times length of nutlets.
Bracts ovate or ovate-lanceolate; corolla 9–13 mm. long.....18. *L. revolutum.*
Bracts linear or oblong-linear; corolla 3–4 mm. long.....19. *L. obtusifolium.*
Corolla medium-sized or large, tube clearly exceeding calyx.
Leaves narrowly linear, 1–3.5 mm. broad, much reduced and inconspicuous in inflorescence; tap-root strongly fusiform-thickened; nutlets somewhat compressed, sharply keeled..20. *L. strictum.*
Leaves (principal ones) 5–30 mm. broad, usually conspicuous in the inflorescence; root not at all thickened; nutlets terete and not obviously keeled.
Leaves with evident veining.
Leaves glaucescent, concolorous; corolla unappendaged.....32. *L. californicum.*
Leaves green, not glaucescent at least above, usually somewhat bicolored; corolla with faucal appendages.
Corolla at most only 1 cm. long, tube cylindrical, lobes divergent, leaves 4–10 mm. broad.
Stems spreading-hirsute, light-colored, usually branched; calyx hirsute...21. *L. Seleri.*
Stems strigose, brownish, usually simple below inflorescence; calyx strigose.....22. *L. medialis.*
Corolla 12–27 mm. long; leaves 4–25 mm. broad.
Corolla gradually dilated, throat with twice diameter of tube-base, lobes usually ascending; stems sparsely but coarsely hirsute.
Cauline leaves linear or lance-linear, 4–8 mm. broad.....23. *L. guatemalense.*
Cauline leaves oblong, 10–25 mm. broad.....24. *L. oblongifolium.*
Corolla almost perfectly cylindrical, lobes usually recurved; stems rather densely short-hirsute or strigose.
Plant green; leaves scabrous above. 25. *L. Palmeri.*
Plant canescent; leaves velutinous above.....26. *L. viride.*

Leaves apparently veinless.
Flowers in a very leafy cylindrical thryse, disposed along rather numerous short spreading branches; corollas greenish or pale yellow, usually less than 1 cm. long, more or less obscured by the foliaceous lanceolate bracts.....27. *L. ruderale.*
Flowers simply racemose or distributed along several elongating ascending corymbosely disposed branches; corolla not noticeably obscured by the small or reduced bracts.
Corolla cylindrical, lacking a differentiated throat, lobes divergent, breadth of limb not exceeding length of tube.
Calyx-lobes twice length of nutlets..28. *L. calycosum.*
Calyx-lobes about half longer than nutlets.
Stems spreading-hirsute.....17a. *L. c. Conzattii.*
Stems strigose.....22. *L. mediale.*
Corolla narrowly funnelform with a dilated throat and ascending lobes or if doubtfully so then with the breadth of limb equalling or exceeding the length of tube.
Later floral leaves reduced, scarcely if at all exceeding the calyx-lobes, somewhat simulating the latter.
29. *L. multiflorum.*
Later floral leaves surpassing the calyx-lobes and not simulating the latter.
Young parts silky-strigose; nutlets 2–3 mm. long; calyx-lobes 5–6 mm. long.....30. *L. canescens.*
Young parts of plant usually coarsely strigose; nutlets 3–4 mm. long; calyx-lobes 6–13 mm. long.
Herbage green; corolla 10 23 mm. broad, lobes spreading; calyx erect in fruit; Atlantic drainage.....31. *L. caroliniense.*
Herbage glaucescent; corolla 4–8 mm. broad, lobes ascending; calyx frequently recurved in fruit; Pacific drainage..32. *L. californicum.*

1. **Lithospermum arvense** L. Sp. Pl. 132 (1753).—Native of Europe and adjacent Asia and Africa. Introduced in Me.!, N. H.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, N. J.!, Penn.!, Del.!, Md.!, D. C., Va.!, W. Va., N. C.!, S. C.!, Ga., Fla., Ont.!, Mich.!, Ohio, Ind., Ky., Tenn., Miss., Ala., Wis., Minn., Iowa, Mo.!, Ark., La., Neb., Kan.!, Mont.!, Utah, Calif., B. C.

2. **L. matamorense** A. DC. Prodr. x. 76 (1846). *L. prostratum*

Buckley, Proc. Acad. Philad. 1861, 462 (1861).—Central Texas southward into Nuevo Leon and Tamaulipas.

3. **L. Pringlei**, sp. nov., annuum 4–6 dm. altum rigidiusculum; caulibus paucis simplicibus vel laxe ascendenterque ramosis strigosis et hirsutis foliosis; foliis nervosis asperis hirsuto-strigosis saepe acutis infra pallidis, inferioribus ante anthesis torrentibus oblanceolatis, superioribus late lanceolatis brevissime petiolatis paullo reductis; racemis simplicibus vel rare furcatis foliosissimis statu fructifero conspicue dissitifloris ad 1–2 dm. longis; corollis flavis 8–10 mm. longis, tubo cylindrato 1.5–2 mm. crasso extus pubescenti calycem aequanti vel paullo superanti, lobis laxe ascendentibus vel (?) divergentibus ca. 1.5 mm. longis, faucibus appendices 5 orbiculares granuloso-pubescentes gerentibus; staminibus inclusis, antheris oblongis longitudine filamenta aequantibus; pedicellis 4–5 mm. longis strictis; calycibus fructiferis lineari-lobatis 8–10 mm. longis; nuculis saepe 4 ca. 2.5–3 mm. longis teretibus.—Mexico: Pedigral, Valley of Mexico, Federal District, 2250 m. alt., *Pringle 6416;* rocky hills near Metepec Station, Hidalgo, 2500 m. alt., June 25, 1904, *Pringle 12123* (type, Gray Herb.).—This very distinct species has been confused with *L. distichum* Ort., though not very closely related to it. In gross habit the new species much suggests *L. latifolium* Michx. and *L. officinale* L., but these species are perennial and have strong taproots. *Lithospermum latifolium* differs further by having broader leaves and more closely appressed strigose pubescence. The European *L. officinale* has thicker leaves, smaller corollas, smaller somewhat deciduous calyx-lobes, and smaller and fewer nutlets.

4. **L. lasiosiphon**, sp. nov., perenne laxe strigosum; caulibus erectis herbaceis 3–6 dm. altis foliosis; foliis obtusis vel rotundatis herbaceis supra viridibus infra glaucescentibus, inferioribus spathulatis 2.5–7 cm. longis 8–14 mm. latis laxe rosulatis paullo obscureque nervosis, superioribus oblanceolatis vel linearibus strictis numerosis gradatim reductis enerviis; racemis geminatis terminalibus strictis ad 15 cm. longis dissitifloris, bracteis linearibus vel lanceo-linearibus saepe calycem superantibus; pedicellis strictis longitudine calycem aequantibus vel vix brevioribus; calycibus fructiferis 5–7 mm. longis ad basin 5-partitis, lobis herbaceis linearibus vel lanceolatis; corollis infundibuliformibus 13–17 mm. longis dilute luteis extus breviter villosis intus sparse villosis lobis laxe ascendentibus limbus 8–10 mm. latis faucibus exappendiculatis; staminibus inclusis, filamentis quam antherae brevioribus; nuculis lucidis ca. 2.5 mm. longis laevibus.—Mexico: at 2250 m. alt. in the Sierra Madre near Colonia Garcia,

Chihuahua, Aug. 10, 1899, *Townsend & Barber 248* (TYPE, Gray Herb.).—In inflorescence and in the shape of its flowers *L. lasiosiphon* strongly suggests *L. multiflorum* Torr., but differs in having persistent basal foliage, less pubescent non-acute leaves that are broadest above rather than below the middle, and corollas that are pubescent inside. The new species is probably most related to *L. cobrense* Greene, but differs from that species in its funnel-formed internally pubescent corollas, and larger and broader not abruptly reduced non-involute leaves. The species is a very distinct one.

5. **L. discolor** Mart. & Gal. Bull. Acad. Brux. xi. 337 (1844). *L. chersinum* Macbr. Contr. Gray Herb. n. s. xlix. 22 (1917). *L. discolor*, var. *candicans* Kuntze, Rev. Gen. ii. 439 (1891).—Pacific slope of southwestern Mexico from Oaxaca to Tepic. Due to its branching habit and very thick decidedly bicolored leaves this is an exceptionally well marked species.

6. **L. hypoleucum**, sp. nov., perenne herbaceum ca. 7 dm. altum; caulibus erectis simplicibus vel apicem versus breviter ramosis dense retrorseque pubescentibus et hirsutis; foliis subsessilibus acutis obovato-oblongis vel oblongo-ovatis 5–7 cm. longis 2–2.5 cm. latis conspicue nervosis, supra viridibus scabris, subtus albidis vel canescentibus dense tomentosis; racemis terminalibus furcatis; calycibus fructiferis ca. 1 cm. longis, lobis linearibus, pedicellis crassis ca. 2 mm. longis bracteas saepe (?) aequantibus vel superantibus; corollis ca. 12 mm. longis (ut videtur albescentibus); tubo cylindrato 2.5–3 mm. crasso calycem 1–2 mm. superante intus medium versus villoso, lobis ascendentibus ca. 2.5 mm. longis, faucibus exappendiculatis; staminibus ad basin tubi adfixis; filamentis brevibus; nuculis ignotis.—MEXICO: Loma St. Maria near Morelia, Michoacan, 1850 m. alt. July 29, 1909, *Arsène 2511* (TYPE, Gray Herb.).—A very well marked species probably most nearly related to *L. discolor* Mart. & Gal. It agrees with its relative in having white or whitish corollas that are pubescent inside, and by having conspicuously bicolored leaves that are tomentose beneath. It differs in having simple coarser herbaceous stems, larger much less firm leaves, tubular rather than funnelform corollas, and longer calyx-lobes. The type was distributed as *Onosmodium bejariense* DC.

7. **L. Nelsonii** Greenm. Proc. Am. Acad. xl. 31 (1904).—Known only from the vicinity of Monterey, Nuevo Leon, and very distinct in its large white salverform corollas, though nevertheless an evident relative of *L. distichum* Ort.

8. **L. peruvianum** A. DC. Prodr. x. 77 (1846). *L. andinum*

Krause, Engler Bot. Jahrb. xxxvii. 636 (1906).—Peruvian Andes at altitudes over 3000 m. The DeCandollean material came from Chachapoyas in northern Peru, and that of Krause from Tarma in central Peru. I have seen a collection from Puno in southern Peru. *Lithospermum incanum* R. & P., Fl. Peruv. ii. 4 (1799), not Forst. (1788), the type of which came from arid hills near Tarma, may be found synonymous with *L. perurianum*. It was described as an herbaceous annual with a fusiform fibrous tap-root, but may have been based on young plants.

9. **L. distichum** Ortega, Hort. Matr. Dec., i. 8 (1797). *Batschia disticha* Don, Gen. Syst. iv. 326 (1838). *L. spathulatum* Mart. & Gal. Bull. Acad. Brux. xi. 337 (1844). *Anchusa mexicana* Sesse & Moc. Pl. Nov. Hisp. 21 (1887). *L. laevigatum* Sesse & Moc. Fl. Mex. 30 (1894). (?) *L. discolor*, var. *subviride* Kuntze, Rev. Gen. ii. 439 (1891).—Southern San Luis Potosi southward to Chiapas. Originally described from garden plants grown from seed said to have come from Cuba. The seeds probably came from Mexico, since only Mexican plants agree with the original description and with Jacquin's plate, Frag. Bot. 42, t. 48, fig. 3 (1809), and since Dr. N. L. Britton writes me that no native *Lithospermum* is known either from Cuba or from any other of the West Indian islands.

10. **L. mirabile** Small, Fl. Southeast. U. S. 999 and 1337 (1903); Schulz, Wild Fl. San Antonio 176 (1922).—Known only from the vicinity of San Antonio, Texas. I doubtfully associate with Small's species a plant in the Gray Herbarium collected by Palmer in Sept. 1880 at Soledad, Coahuila. The specimen mentioned has nutlets as coarsely roughened as those on isotypic material of *L. mirabile*, but has nutlets lacking the conspicuous angular margins of the authentic material. The specimen is further atypical in having a funnel-form corolla about as long as the calyx, rather than one much exceeding the calyx. The plant from about San Antonio has a characteristic aspect, a fact which, coupled with its peculiar angled and roughened nutlets, seems to make it desirable for the present, at least, to consider the species as one of restricted range, although very close to and somewhat doubtfully distinct from *L. angustifolium* Michx.

11. **L. angustifolium** Michx. Fl. Bor. Am. i. 130 (1803). *Cyphorima angustifolia* Nieuwl. Am. Midland Nat. iii. 194 (1914). *L. fimbriatum* Nutt. in Fras. Cat. no. 11 (1813), nom. nud. *Batschia longiflora* Nutt. in Pursh, Fl. Sept. Am. i. 132 (1814); Nutt. Gen. i. 114 (1818). *L. longiflorum* Spreng. Syst. i. 544 (1825). *Pentalophus longiflorus* A. DC. Prodr. x. 86 (1846). *C. longiflora* Raf. in Hook. f. & Jacks.

Ind. Kew. i. 701 (1893). *B. decumbens* Nutt. Gen. i. 114 (1818). *L. decumbens* Torr. Ann. Lyceum N. Y. ii. 225 (1826). *C. decumbens* Raf. in Hook. f. & Jacks. Ind. Kew. i. 701 (1893). *L. incisum* Lehm. Asperif. ii. 303 (1818). *L. linearifolium* Goldie, Edinb. Philos. Jour. vi. 322 (1822). *C. linearifolia* Lunell, Am. Midland Nat. iv. 514 (1916). *L. mandanense* Spreng. Syst. i. 544 (1825); Hook. Fl. Bor. Am. ii. 88, t. 166 (1838). *P. mandanensis* A. DC. Prodr. x. 87 (1846). *C. mandanensis* Lunell, Am. Midland Nat. iv. 515 (1916). *L. breviflorum* Engelm. & Gray, Jour. Boston Soc. Nat. Hist. v. 252 (1845). *L. asperum* Nels. Bull. Torr. Bot. Cl. xxvi. 244 (1899). *L. albicans* Greene, Pittonia iv. 91 (1899). *L. ciliolatum* Greene, l. c. 92. *L. oblongum* Greene, l. c. 92.—Extreme southern Ontario to Illinois and Manitoba, thence to Coahuila, Chihuahua, eastern Arizona, Utah and eastern British Columbia. This is a very variable, but certainly a natural assemblage which intensive study will probably show divisable into a number of good geographic varieties. Among normal plants there is considerable variation in size and form of corolla. The eastern material has very large corollas with conspicuously fringed lobes; material from Wyoming has very much smaller flowers; whereas material from Texas has small corollas with short entire lobes. Over most of its range the plant grows 2.5–4 dm. high, but in Wyoming it is commonly about 1 dm. tall.

Since the appearance of the note by Bebb, Am. Nat. vii. 691 (1873), and the acceptance of Bebb's findings by Gray, Synop. Fl. N. Am. ii. pt. 1, 205 (1878), this species has been considered dimorphic, including a phase with very conspicuous salverform normal corollas, and one with very inconspicuous cleistogamous flowers. These two phases are so different in appearance that they were formerly treated not only as of different species, but even of separate genera. Indeed so different do the two forms appear, that only the repeated acceptance of Bebb's findings and the complete lack of dissenting opinion during the last fifty years makes me at all content to associate the two forms under one specific name. I am somewhat troubled, however, at the apparent lack in the herbarium of forms transitional between the two phases. The two states differ in the following points. The normal form has simple erect stems terminated by a compact very floriferous inflorescence composed of short crowded branches bearing showy salverform apparently sterile corollas on erect pedicels. The cleistogamous phase is diffusely branched and bears its inconspicuous fertile flowers in very elongate racemes and its fruit on recurved pedicels.

The type of *L. linearifolium* Goldie, grew "only on sandy beaches

at the head of Lake Ontario." Recent collectors do not appear to have collected *L. angustifolium* there, and so it may be that Goldie's species is not properly referred to the older one of Michaux. However, "nuculis impresso-punctatis" and "foliis linearibus" of the short original description agree better with *L. angustifolium* than with any of the species that are known from the general region.

Several attempts have been made at giving this species special generic recognition. Justification for such steps have been found in the shape of the corolla, in its fimbriate lobes, and in its large faucal appendages. These, however, are all characters which are variable within the species and which would utterly fail to characterize a genus decisively. Halsted, Bot. Gaz. xiv. 202 (1889), has pointed out certain peculiarities of the pollen of this species which deserve further study, since they may furnish additional specific characters.

12. **L. tuberosum** Rugel in DC. Prodr. x. 76 (1846).—Tennessee to Georgia and southward to Alabama and Florida. This species can at once be recognized by its tuberous roots. Gray reported the species from Texas, but his record was based upon fruiting material of *Onosmodium Helleri* Small.

13. **L. cobrense** Greene, Bot. Gaz. vi. 157 (1881). (?) *L. tubuliflorum* Greene, Pittonia i. 155 (1888).—Southern Arizona and New Mexico southward to southern Durango. A species well characterized by its rather large very yellow corollas, rosettes of large basal leaves, and abruptly reduced cauline foliage.

14. **L. obovatum** Macbr. Contr. Gray Herb. n. s. xlviii. 56 (1916). —Known only from the type collection made at Quebrada Honda, Durango. It is perhaps better treated as a variety of *L. cobrense*, since it differs merely in having broader, more definitely obovate basal leaves.

15. **L. latifolium** Michx. Fl. Bor. Am. i. 131 (1803). *L. officinale*, var. *latifolium* Lehm. Asperif. ii. 311 (1818). *Cyphorima latifolia* Raf. in DC. Prodr. x. 76 (1846). *C. lutea* Raf. Cat. 13 (1824). *L. luteum* House, Bull. N. Y. State Mus. 243–244, pg. 61 (1923). *L. lutescens* Coleman, Cat. Pl. Grand Rapids 29 (1874).—Western New York to southern Minnesota and southward to eastern Tennessee. The Kew Index, iii. 99 (1894), gives the binomial, *L. latifolium*, as having been proposed by Forskål as well as by Michaux. Forskål did not publish such a binomial at the citation given by the Kew Index, i. e. "Fl. Aegypt. Arab. 39," and there appears to be no evidence that he ever published such a name.

16. **L. officinale** L. Sp. Pl. 132 (1753).—Native of Europe and the

Mediterranean region. Introduced in Que.!, N. B., Me.!, N. H.!, Vt.!, Mass.!, R. I., Conn.!, N. Y.!, N. J.!, Ont., Mich.!, Wis., Ohio, Ind., Minn.

17. **L. calcicola** Robins. Proc. Am. Acad. xxvii. 182 (1892).—Nuevo Leon southward to Oaxaca.

17a. **L. calcicola,** var. **Conzattii** (Greenm.), comb. nov. *L. Conzattii* Greenm. Bull. Field. Mus., Bot. ii. 339 (1912).—Known only from the type collection made in Oaxaca. Macbride, Contr. Gray Herb. n. s. xlviii. 55 (1916), considers this to be "only a young state of *L. calcicola*," but because of its relatively large exserted corollas it appears to merit varietal rank at least.

18. **L. revolutum** Robins. Proc. Am. Acad. xxvii. 182 (1892). *Onosmodium revolutum* Macbr. Contr. Gray Herb. n. s. xlix. 21 (1917). —Known only from San Luis Potosi. Macbride, l. c., has referred this species to *Onosmodium*, considering the species most related in that genus yet with characters more or less intermediate between *Onosmodium* and *Lithospermum*. However, the species has a corolla with a funnelform throat and ascending lobes, a comparatively short and lobed style that is not exserted until the corolla is completely opened, oblong obtuse anthers, and unnerved leaves—all characters which unmistakably and definitely ally it with *Lithospermum* and exclude it from the habitally very different *Onosmodium*.

19. **L. obtusifolium,** sp. nov., perenne 1.5–3 dm. altum; caulibus paucis e radice longa et recte descendenti orientibus ascendentibus vel decumbentibus strigosis ramosis; foliis concoloribus enerviis strigosis sessilibus 2–3.5 cm. longis 3–9 mm. latis apicem versus latioribus oblongis vel linearibus inferioribus praecociter deciduis superioribus paullo reductis; floribus parvis inconspicuis 3–5 mm. longis; corolla calycem subaequali, lobis saepe laxe ascendentibus minus quam 1.4 mm. longis, tubo cylindrato intus glabro, faucibus appendiculatis; antheris oblongis longitudine filamenta aequantibus; pedicellis strictis 3–10 mm. longis; nuculis saepe 3 lucidis ca. 2.5 mm. longis.—Mexico: sandy places near San Miguelito, San Luis Potosi, 1876, *Schaffner 728* (type, Gray Herb.); Levios, 45 mi. E. of Saltillo, Coahuila, *Palmer 900;* Soledad, 25 mi. W. of Monclova, 1880, *Palmer*. United States: Chiricahua Mine, Chiricahua Mts., Arizona, *Blumer 1796*.—The status of this species is somewhat dubious. The Mexican material comes from a small natural area and is probably homogeneous, although *Palmer 900* has very narrow somewhat involute leaves. The Arizonian material is without flowers. It is readily separable from all the species occurring in the United States, and matches sur-

prisingly *Shaffner 728*. Two of the cited specimens are mutilated, *Shaffner 728* and *Palmer 900* having had the main axis nipped off, apparently at an early age. These specimens may represent the cleistogamous phase of some species, but if so I have been unable to correlate it with any of the well known species. Since the plants form a definable group they are here described as representing an unnamed species. Part of the material was referred by Macbride to his *L. strictum*, var. *calycosum*.

20. **L. strictum** Lehm. Asperif. ii. 303 (1818). *Anchusa tuberosa* HBK. Nov. Gen. et Sp. iii. 92 (1818). *Heliotropium lithospermoides* R. & S. Syst. iv. 737 (1819).—Southern Coahuila southward to the states of Mexico and Puebla; most frequently collected in San Luis Potosi. This is an exceptionately well marked species characterized by its thickened fusiform or bottle-shaped root, very narrow leaves, compressed sharply keeled nutlets, and very long simple inconspicuously bracted unilateral racemes of elongate salverform corollas. In gross aspect the plant somewhat suggests *Amsinckia Douglasiana* DC.

21. **L. Seleri**, sp. nov., perenne; caulibus ascendentibus stramineis simplicibus strigosis et hirsutis ca. 3 dm. altis; foliis lanceolatis acutis 2.5–4.5 cm. longis 4–10 mm. latis breviter petiolatis conspicue nervosis, supra pustulatis, infra pallidioribus strigosis; racemis geminatis terminalibus hispidis; floribus luteis ca. 1 cm. longis, corollae tubo cylindrato extus villoso intus glabro calycem paullo longiori, lobis laxe ascendentibus ca. 2 mm. longis, faucibus granulatis; antheris oblongis quam filamenta longioribus; calycibus fructiferis ca. 8 mm. longis hispidis, lobis linearibus quam nuculae duplo longioribus: nuculis ca. 2.5 mm. longis. MEXICO: near Puebla, July 1888, *Seler 847* (TYPE, Gray Herb.).—This species appears to be most closely related to *L. mediale* Johnston, but differs from that in its spreading stiff pubescence, stramineous stems, and longer calyx-lobes. The type has been mutilated and has a number of ascending branches. It seems to have a weak perhaps only biennial root.

22. **L. mediale**, sp. nov., perenne 3–5 dm. altum canescens; caulibus erectis simplicibus vel apicem versus breviter ramosis compluribus a radice simplici recta orientibus foliosis strigosis; foliis strictis vel ascendentibus firmis oblongo-ovatis vel lanceolatis saepe concoloribus strigosis rare supra pustulatis (saepe cum nervis paucis validisque) subsessilibus 3–6(–9) cm. longis 4–13(–17) mm. latis superne paullo reductis; racemis terminalibus geminatis vel ternatis; floribus ochroleucis ca. 1 cm. longis, corollae tubo cylindrato calyce saepe duplo

longiori extus villoso intus glabro; lobis laxe ascendentibus vel divergentibus 1–2 mm. longis, faucibus appendiculatis; antheris oblongis quam filamenta duplo longioribus; pedicellis 1–2 mm. longis strictis; calycibus fructiferis ca. 5 mm. longis, lobis linearibus quam nuculae vix longioribus; nuculis saepe 2–3 albis nitidis 2.5–3 mm. longis.—GUATEMALA: on cultivated ground, trachyte mountain Chi Lahuh K'ik, Dept. Quezaltenango, June 10, 1896, *Seler 2893* (TYPE, Gray Herb.); San Lucas, Dept. La Antigua, *Seler 2462*; Santiago, Dept. Zacatepeque, *Gomez 812*. COLOMBIA: Sibate, Dept. Cudinamarca, *Pennell 2468* (NY, G); Zipacon, Dept. Cundinamarca, *Rusby & Pennell 1217* (G); El Dintel, *Bro. Ariste-Joseph A.525* (G); San Antonio, *Bro. Ariste-Joseph A.447* (G); Facatative, *André 669* (NY); vicinity of Bogotá near Tequendama Falls, Dec. 1852, *Holton* (NY); without locality, *Bro. Ariste-Joseph B-44* (US). VENEZUELA: between Mucurulea and Mucuchies, Dept. Los Andes, *Jahn 801* (NY).—This very characteristic species is apparently restricted to central and northern South America. It has been mainly confused with the very different *L. discolor* Mart. & Gal., although its closest relative appears rather to be *L. distichum* Ort. The new species can be usually recognized by its canescence, firm leaves with few or no strong veins, short calyx-lobes that just exceed the nutlets, and very pale yellowish corollas. Material from Guatemala and Colombia seems quite indistinguishable, and is evidently referable to a single species. I have a suspicion that Kuntze's *L. discolor*, var. *subviride*, Rev. Gen. ii. 439 (1891), was based on a plant of this species.

23. **L. guatemalense** Donn. Sm. Bot. Gaz. xxvii. 436 (1899).—This was described from a collection made in the Dept. of Heuheutenango, in southeastern Guatemala. I have seen no authentic material of the species, but associate with it the left-hand plant on the sheet of *Ghiesbreght 804* now preserved in the Gray Herbarium. I have strong suspicions that *L. guatemalense* will be found to be merely a narrow-leaved phase of *L. oblongifolium* Greenm.

24. **L. oblongifolium** Greenm. Proc. Am. Acad. xxxii. 300 (1897). (?) *L. discolor*, var. *canescens* Kuntze, Rev. Gen. ii. 439 (1891).—I know of only two collections, one, the type, collected in the Federal District of Mexico, the other collected by Ghiesbreght (no. *804* in part) in the pine forests of southern Mexico. The latter is coarsely hirsute and I associate with it Kuntze's varietal name.

25. **L. Palmeri** Wats. Proc. Am. Acad. xviii. 122 (1883).—Nuevo Leon and adjacent Coahuila. This differs from *L. viride* Greene, in pubescence, somewhat coarser habit, and isolated southern range,

and might with good reasons be treated as a geographic variety of that species.

26. **L. viride** Greene, Bot. Gaz. vi. 158 (1881).—Southern New Mexico and Arizona.

27. **L. ruderale** Dougl. in Lehm. Pug. ii. 28 (1830). *L. pilosum* Nutt. Jour. Acad. Philad. vii. 43 (1834). *Batschia pilosa* Don, Gen. Syst. iv. 372 (1838). *L. Torreyi* Nutt. l. c. 44. *B. Torreyi* Don, l. c. *L. ruderale,* var. *Torreyi* Macbr. Contr. Gray Herb. n. s, xlviii. 55 (1916). *L. laxum* Greene, Pittonia iii. 263 (1898). *L. lanceolatum* Rydb. Mem. N. Y. Bot. Gard. i. 333 (1900). *L. ruderale,* var. *lanceolatum* Nels. Bot. Gaz. lii. 272 (1911). *L. ruderale,* var. *macrospermum* Macbr. l. c.—Southern Alberta to western Colorado, westward to British Columbia and northern California. Although constant in its very characteristic leafy inflorescence, the species varies in size of nutlets and corollas, in pubescence, and in leaf-shape. The most striking and important of these variations is the var. *macrospermum,* the prevailing if not the only form of the species in eastern Oregon, and adjacent Idaho, Nevada and California. This variety has comparatively large nutlets, 5–8 mm. long (the largest in the genus), which have a very prominent basal flange.

28. **L. calycosum** (Macbr.), comb. nov. *L. strictum,* var. *calycosum* Macbr. Contr. Gray Herb. n. s. xlviii. 56 (1916).—Southern San Luis Potosi, Guanajuato and Hidalgo. Although originally described as a variety of *L. strictum* this species is abundantly distinct, differing in its unthickened root, branched habit, broader leaves, and terete unkeeled nutlets.

29. **L. multiflorum** Torr. in Gray, Proc. Am. Acad. x. 51 (1874); Wats. Bot. King Exped. 238 (1871), nom. nud.—Southern Wyoming southward to Arizona and northern Chihuahua.

30. **L. canescens** (Michx.) Lehm. Asperif. ii. 305 (1818). *Batschia canescens* Michx. Fl. Bor. Am. i. 130, t. 14 (1803). *Anchusa canescens* Muhl. Cat. 19 (1813). *A. virginiana* L. Sp. Pl. 133 (1753); not *L. virginianum* L. l. c. 132. *L. sericeum* Lehm. Asperif. ii. 306 (1818). *B. sericea* R. & S. Syst. iv. 743 (1819). *B. conspicua* R. Br. in Richards. Bot. App. to Frankl. Jour. 732 (1823).—Along the Appalachians from southern Pennsylvania south into Alabama and westward through Ohio to Kansas and Saskatchewan.

31. **L. caroliniense** (Walt.) MacMill. Metasp. Minn. Valley 438 (1892). *Anonymos caroliniense* Walt. Fl. Carolina 91 (1788). *Batschia caroliniensis* Gmel. Syst. i. 315 (1791). *L. carolinianum* Lam. Tab. Encyc. i. 397 (1791); Mack. Bull. Torr. Bot. Cl. xxxii. 501

(1905). *Onosmodium carolinianum* A. DC. Prodr. x. 70 (1846). *B. Gmelini* Michx. Fl. Bor. Am. i. 130 (1803). *L. Gmelini* Hitchc. Spring. Fl. Manhattan 30 (1894). *Anchusa hirta* Muhl. Cat. 19 (1813); nom. nud. *L. hirtum* Lehm. Asperif. ii. 304 (1818). *L. strigosum* Raf. New Fl. N. Am. pt. 4, 18 (1836). *L. bejariense* A. DC. Prodr. x. 79 (1846).—Western New York west to Montana, and southward through Nebraska to Texas, Tamaulipas and Louisiana. Also in South Carolina, Georgia, and Florida.

32. **L. californicum** Gray, Proc. Am. Acad. x. 51 (1875).—Northern California and adjacent Oregon.

13. **Antiphytum** DC. in Meisner, Genera i. 280; ii. 188 (1840).

Amblynotopsis Macbr. Contr. Gray Herb. n. s. xlviii. 41 (1916).—A review of this genus has been recently published, Contr. Gray Herb. n. s. lxviii. 48–52 (1923). Recent study has shown, however, that the species there called *Antiphytum tetraquetrum* is properly excluded from the genus and should be referred to *Thaumatocaryon*.

14. **Mimophytum** Greenm. Proc. Am. Acad. xli. 242 (1905).

Mimophytum omphalodoides Greenm. Proc. Am. Acad. xli. 242 (1905).—This monotype is known only from the type collection taken from under a wet cliff in the barranca below Honey Station, 1500 m. alt., Puebla, Mexico, by Pringle in 1904. In gross aspect the plant remarkably simulates the Mexican species of *Omphalodes*, although in technical fruiting characters it seems quite distinct and much nearer *Cynoglossum*.

15. **Cynoglossum** [Tourn.] L. Sp. Pl. 134 (1753); Gen. Pl. 65 (1754).

KEY TO SPECIES.

Nutlets sunken in dorsally and having a definite elevated margin.
  Plant a slender freely branched annual; nutlets small, 2–3 mm. long, dorsal area practically unarmed ..... 1. *C. Wallichii.*
  Plant a coarse biennial, branched only above; nutlets large, 5–10 mm. long, dorsal area densely armed.
    Nutlets 5–7 mm. long, ovate in dorsal outline; style well developed, surpassing mature nutlets by 3–5 mm.; Eurasian ..... 2. *C. officinale.*
    Nutlets 8–10 mm. long, suborbicular in dorsal outline; style weakly developed, 1–2 mm. long, obscured and surpassed by nutlets; Mexican ..... 3. *C. Pringlei.*
Nutlets not sunken in dorsally and lacking a definite elevated margin.
  Plant biennial; European introductions.
    Corolla small, 4–5 mm. long; nutlets small, 2.5–4 mm. long; leaves all acute, upper ones with a narrow cuneate base. 4. *C. zeylanicum.*

Corolla large, 6–8 mm. long; nutlets large, ca. 6 mm. long; some of leaves usually obtusish, at least upper with a broad subamplexicaul base.....5. *C. creticum.*
Plant perennial; native American species.
Nutlets small, 2–3 mm. long, equalled or exceeded by calyx-lobes.
Fruiting pedicels 2–3 cm. long, stiffly and horizontally extended; calyx-lobes reflexed at maturity, 2–2.5 mm. long, about equalling fruit.....6. *C. paniculatum.*
Fruiting pedicels 0.5–1 cm. long, recurved; calyx-lobes spreading at maturity, 3–5 mm. long, much exceeding the fruit.....7. *C. limense.*
Nutlets larger, 4–10 mm. long, if less than 5 mm. long then conspicuously exceeding the calyx-lobes.
Mature leaves glabrous on upper surface; stems glabrate or sparingly hirsute or strigose.
Leaves tapering at base; stems strigose above; pedicels recurved in fruit; corolla-appendages semilunate, included; South American.....8. *C. Trianaeum.*
Leaves abruptly contracted to a slender petiole; stems glabrous above; fruiting pedicels ascending or gracefully outcurved; corolla-appendages oblong, protruded; North American.....9. *C. grande.*
Mature leaves evidently hirsute or hispid on upper surface; stems conspicuously hirsute.
Calyx-lobes 5–10 mm. long in fruit, linear or lanceolate; corolla-tube 3–5 mm. long, about twice length of lobes; style conspicuous, 5–9 mm. long.
Stems villous; leaves 10–16 mm. broad; stamens slightly exserted from throat.....10. *C. viride.*
Stems hirsute; leaves 15–30 mm. broad; stamens included.....11. *C. occidentale.*
Calyx-lobes 1–2.5 mm. long in fruit, ovate; corolla-tube 1.5–3 mm. long, exceeded by the lobes; style obscured by the nutlets, 1–2 mm. long.
Nutlets 5.5–7 mm. long.....12. *C. virginianum.*
Nutlets 3.5–5 mm. long.....13. *C. boreale.*

1. **Cynoglossum Wallichii** Don, Gen. Syst. iv. 354 (1837). *C. glochidatum* Wall. Cat. 26 (1829), nom. nud.; Benth. in Royle, Ill. i. 306 (1839).—Native of central Asia and India. Adventive in 1902 in a garden at Hardwick, Mass.

2. **C. officinale** L. Sp. Pl. 134 (1753).—Native of Eurasia, extending from the western Mediterranean region eastward to central Asia. Introduced in Que.!, Me., N. H., Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, N. J., Penn.!, Md., Del., Va.!, W. Va.!, N. C., Ont.!, Mich.!, Ohio!, Ind.!, Ill.!, Tenn., Ky., Ala., Wis., Iowa!, Mo.!, Ark., Neb., Kan.!, N. D., Mont., Wyo.!, Colo.!, Ut.!, N. M., Ore.!

3. **C. Pringlei** Greenm. Proc. Am. Acad. lx. 30 (1904).—Mexico: Fultenango Canyon, State of Mexico, *Pringle 11350* (type); vicinity of Moralia, Michoacan, *Arsène 5949;* Guanajuato, 1893, *Dugès.*—Although closely related to *C. officinale* this species, a native of south

central Mexico, is clearly distinct in its larger and differently shaped nutlets and short style. Frequently only a single nutlet is matured from each flower.

4. **C. zeylanicum** (Vahl.) Thunb. in Lehm. Neue Schrift. Naturf. Gess. Halle ser. 3, ii. 20 (1817). *Anchusa zeylanica* Vahl. in Hornm. Enum. Hafn. 3 (1807), hyponym? *C. furcatum* Wall. in Roxb. Fl. Ind. ii. 6 (1824).—Native of southeastern Asia. In the United States National Herbarium there is a specimen of this species collected in 1899 by Dr. O. Buchtien at Valdivia, Chile. The species is not otherwise known from America.

5. **C. creticum** Mill. Gard. Dict. ed. 8. (1768); Brand, Pflanzenr. iv. Fam. 252, i. 129 (1921). *C. pictum* Soland, in Ait. Hort. Kew. i. 179 (1789). *C. molle* Phil. Linnaea xxix. 18 (1857).—Native of the Mediterranean region. Long ago naturalized in south central Chile whence it was described as a native species by Philippi.

6. **C. paniculatum** H. & A. Bot. Beech. 37 (1830). *C. Azocarti* Phil. Anal. Univ. Chile lxv. 62 (1884). *C. paniculatum*, var. *Azocarti* Reiche, Anal. Univ. Chile cxxi. 248 (1908). *C. paniculatum*, forma *Azocarti* Brand, Pflanzenr. iv. Fam. 252, i. 137 (1921). *C. paniculatum*, forma *Philippianum* Brand, l. c.—South central Chile. Reiche, l. c., attributes the species to Peru. The plant is well marked by its exceptionally elongate pedicels.

7. **C. limense** Willd. Sp. Pl. i. 762 (1798); Brand, Pflanzenr. iv. Fam. 252, i. 142 (1921). *C. decurrens*, var. *limense* A. DC. Prodr. x. 153 (1846). *C. decurrens* R. & P. Fl. Peruv. ii. 6 (1799). *C. alatum* Molina, Sagg. Chile ed. 2, 280 (1810).—Middle and southern Chile. The type of the species is reputed to have come from the vicinity of Lima, Peru.

8. **C. Trianaeum** Wedd. Chlor. And. ii. 90 (1859).—Mountains of Colombia and adjacent Ecuador.

9. **C. grande** Doügl. in Lehm. Pug. ii. 25 (1830). *C. laeve* Gray, Synop. Fl. N. Am. ii. pt. 1, 188 (1878). *C. grande*, var. *laeve* Gray, l. c. suppl. 421 (1886) (?) *C. Austinae* Eastw. Bull. Torr. Bot. Cl. xxxii. 203 (1905).—From Monterey and Calaveras counties, California, northward to extreme southern British Columbia.

10. **C. viride** Eastw. Proc. Calif. Acad. Sci. ser. 2, vi. 428, t. 59 (1897).—Sierra Nevada, California, from Calaveras to Tulare counties.

11. **C. occidentale** Gray, Proc. Am. Acad. x. 58 (1875).—From Plumas and Glen counties, California, northward to central Oregon.

12. **C. virginianum** L. Sp. Pl. 134 (1753). *C. virginicum* L. Syst.

ed. 12, 146 (1767). *C. amplexicaule* Michx. Fl. Bor. Am. i. 132 (1803). *C. lucidum* Stokes, Bot. Mat. Med. i. 277 (1812).—Southern Connecticut southward to northern Florida, west to Louisiana and Missouri.

13. **C. boreale** Fernald, Rhodora vii. 250 (1905).—New Brunswick and adjacent Quebec, southward to northern Connecticut, westward through New York and southern Ontario to northern Michigan; reappearing in southern British Columbia. All the vegetative characters of this species can be matched, after a short search, among indubitable material of *C. virginianum*. It usually differs, however, in its more slender habit, less stiff pubescence, more elongate slender pedicels, and smaller floral parts; and seems to be always distinct in its smaller nutlets and northern range. Brand, Pflanzenr. iv. Fam. 252, i. 131 (1921), reduces the species outright to *C. virginianum*, but surely it is deserving of varietal rank at the very least.

16. **Pectocarya** DC. in Meisner, Genera i. 279; ii. 188 (1840).

Ktenospermum Lehm. Del. Sem. Hort. Hamburg 17 (1837), nom. nud. *Gruvelia* A. DC. Prodr. x. 119 (1846).

Key to Species and Varieties.

Nutlet-margins lacerate or undulate or uncinate-bristly, usually ascending or erect. § *Eupectocarya.*
- Back of nutlets armed with coarse subulate appendages similar to those forming the margin ..... 1. *P. anomala.*
- Back of nutlets without coarse subulate appendages; margin well defined.
  - Plant erect, ascendingly branched above; body of nutlets obovate; calyx-lobes surpassing the nutlets..... 2. *P. lateriflora.*
  - Plant prostrate or decumbent, much branched from the base; body of nutlets usually linear or oblong, rarely somewhat obovate; calyx-lobes equaled or surpassed by nutlets.
    - Nutlets with margins pectinately lacerate or dentate to near base and in addition usually uncinate-bristly about apex ..... 3. *P. gracilis.*
    - Fruit similar throughout plant, not dimorphic.
      - Body of nutlets definitely linear.
        - Nutlet-margin very narrow and inconspicuous..var. *genuina.*
        - Nutlet-margin broad and very conspicuous....var. *platycarpa.*
      - Body of nutlets obovate or oblong-obovate.....var. *boliviana.*
    - Fruit dimorphic, with normal divaricate nutlets borne on branches and peculiar reflexed persistent ones borne about base of plant.....var. *dimorpha.*

Nutlets with margins entire or undulate along sides, armed only at apex where densely uncinate-bristly. 4. *P. penicillata.*

Nutlets similar, all margined; fruit not dimorphic, similar in all parts of plant.....var. *genuina.*

Nutlets dissimilar, fruit on the branches consisting of two evidently margined and two unmargined nutlets, fruit borne at base of plant with consimilar unmargined strongly reflexed nutlets. . . var. *heterocarpa*.
Nutlet-margin entire, lacking uncinate-hairs or lacinae or teeth.
§ *Gruvelia*.
Nutlets equally divergent, marginless, obviously angular and rhomboid in outline; calyx-lobes strigose with appressed uncinate hairs towards the tip; plant very slender, branched mainly near base, sparsely strigose. . . . . 5. *P. pusilla*.
Nutlets divergent in pairs, some usually wing-margined, obscurely angular, obovate or rhomboid-obovate in outline; calyx-lobes strigose and sparsely spreading hirsute; plant stiffish, becoming freely branched, very strigose. . . . 6. *P. setosa*.
Fruit with nutlets all wing-margined. . . . . var. *holoptera*.
Fruit with some of nutlets lacking a wing-margin.
Nutlets all marginless. . . . . var. *aptera*.
Nutlets margined and unmargined in the same fruit. . . . . var. *genuina*.

1. **Pectocarya anomala,** sp. nov., erecta 7–15 cm. alta dichotoma strigosa supra laxe ramosa; foliis linearibus 1–3 cm. longis 0.8–1 mm. latis sparse hispidis inferioribus oppositis; pedicellis recurvatis quam bracteae foliaque multo brevioribus; sepalis lanceolatis quam nuculae paullo longioribus; nuculis obovato-oblongis ca. 0.7–0.8 mm. latis 1.5–1.7 mm. longis granulatis, dorso et marginibus cum appendicibus valdis uncinatis subulatis subteretibus uncinato-pubescentibus ca. 1–1.2 mm. longis munitis, marginibus inconspicuis.—PERU: sandy pampa on the southern slope of Chachani Mountain near Arequipa, 2400 m. alt., *Mr. & Mrs. F. E. Hinkley 41* (TYPE, Gray Herb.).—Although in habit clearly a *Pectocarya* this species is quite anomalous in the genus in having the back of the nutlet, not unarmed and margined, but studded with coarse uncinate subulate uncinately pubescent appendages which are quite indistinguishable from those of the proper margin. The plant is erect-growing with a few loosely ascending branches from above the middle. In this habit it differs from *P. gracilis* and *P. penicillata,* and agrees with *P. lateriflora.* It is, however, a lower, less stiff, and less strictly branched plant than the latter. According to its collectors the plant is locally known as "estrella gateadora."

2. **P. lateriflora** (Lam.) DC. Prodr. x. 120 (1846). *Cynoglossum lateriflorum* Lam. Encycl. ii. 239 (1786); Planch. t. 92, fig. 2 (1791). *Mattia lateriflorum* Don, Gen. Syst. iv. 310 (1838). *C. pilosum* R..& S. Fl. Peruv. ii. 6, t. 111b (1799). *M. pilosa* Don, l. c. *Rindera pilosa* R. & S. in DC. l. c. (?) *Ktenospermum linifolium* Lehm. Linnaea xii. Lit. 84 (1838); nom. nud.—Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), has taken *P. lateriflora* as including the two following

species, but as here taken it is in a much more limited sense and restricted to the Peruvian plants originally described. The species is known only from the western strip of Peru, and is well characterized by its erect habit of growth.

3. **P. gracilis** (R. & P.), comb. nov. *Myosotis gracilis* R. & P. Fl. Peruv. ii. 5 (1799). *Echinospermum gracile* Lehm. Asperif. i. 129 (1818). *Rochelia gracilis* R. & S. Syst. iv. 111 (1819). *Cynoglossum lineare* R. & P. l. c. 6. *P. linearis* DC. Prodr. x. 120 (1846). *P. chilensis* DC. l. c. (?) *P. chilensis*, var. *californica* Torr. Pacif. R. R. Rep. iv. 124 (1857).

3a. **P. gracilis**, var. **genuina**.—This is the common species of *Pectocarya* in Chile and Argentina. It is uncommon in North America, apparently restricted there to Southern California and to the islands off that coast. The following cited collections represent all the material of true *P. gracilis* which I have seen from North America.—San Diego, *Brandegee 1636* (G, P); Granite, San Diego County, *Spencer 115* (G); Palm Springs, *Margaret Ferguson 41* (Wellesley College Herb.); Butte west of Lakeview, 1920, *Johnston* (P); Temescal Canyon, *Munz & Harwood 3387* (G); foothills of San Bernardino Mts., 1896, *Cummings* (G); Claremont, *Munz 2005* (P), *Baker 4135* (P); Surprise Canyon, Panamint Mts., *Coville & Funston 721* (G); Santa Cruz Island, 1887, *Ford* (G); Catalina Island, *Grant 913* (G); Clemente Island, *Munz 6690* (G, P); Guadalupe Island, *Palmer 69a* (G), *Anthony 237* (G).

3b. **P. gracilis**, var. **platycarpa** Munz & Johnston, var. nov., ascendens saepe robustior; margine nuculae grosse dentato ca. 1 mm. lato valde conspicuo.—ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G); Wickenburg, *W. W. Jones 88* (G); Tucson, *Greene 1109* (G); mesas near Camp Lowell, April 16, 1881, *Pringle* in part (TYPE, Gray Herb.); without locality, 1884, *Pringle* (G). UTAH: valley of Virgin near St. George, *Parry 167* (G). CALIFORNIA: Agua Caliente, *Parish Bros. 122* (G); Chuckawalla Valley, *Munz & Keck 4804* in part (G); Providence Mts., *Munz & Harwood 3532* (P), *3535* in part (P); east of Daggett, *Munz & Harwood 3673* (P).—This well marked variety seems to replace the var. *genuina* in the deserts of California, Arizona, and Utah. With only North American material at hand the plant seems so extreme and positive as to merit specific rank. However, the South American material of the var. *genuina* frequently has rather broadly margined nutlets that show an approach to the condition characteristic of the var. *platycarpa*, and it hence seems best to treat the latter merely as a variety of the same species.

3c. **P. gracilis**, var. **boliviana**, var. nov., ramosa prostrata; nuculis obovatis vel oblongo-obovatis.—BOLIVIA: Chignana, 3700 m. alt., *Asplund 3897* (TYPE, U. S. Nat. Herb.); Challapata, 3900 m. alt., *Asplund 5895* (US); Teneral Campero, 4200 m. alt., *Asplund 5894* (US); Atocha, 3700 m. alt., *Asplund 5896* (US).—This appears to be the northern phase of *P. gracilis* in South America. The cited suite of specimens is uniform in the crucial characters of the variety, the obovate body of the nutlet, but as to margining varies from conspicuously pectinate-dentate to almost naked.

3d. **P. gracilis**, var. **dimorpha**, var. nov., ramosa prostrata; fructis dimorphis, superioribus nuculas divaricatas compressas normales gerentibus, infimis nuculas reflexas crassas persistentes gerentibus; nuculis oblongis.—CHILE: Vallemar, *Rose 19331* (US); Desert of Atacama, *Morong 1282* (TYPE, Gray Herb.; ISOTYPE, N. Y. Bot. Gard.).—This plant of northern Chile is evidently not typical of the var. *genuina* and because of its conspicuously dimorphic nutlets appears to deserve special varietal recognition. The normal nutlets have a very broad, erect, merely toothed margin.

4. **P. penicillata** (H. & A.) A. DC. Prodr. x. 120 (1846). *Cynoglossum penicillatum* H. & A. Bot. Beech. 371 (1840). *P. linearis*, var. *penicillata* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895). *P. miser* Nels. Bot. Gaz. xxxvii. 278 (1904).—In its two forms this is the most common and widely distributed of the North American Pectocaryas. Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), takes up *Cynoglossum Nuttallii* Spreng., Syst. i. 566 (1825), as the earliest name of the present species. Sprengel's name, however, is based upon *C. pilosum* of Nuttall, Gen. i. 114 (1818), which is, as Gray, Synop. Fl. N. Am. ii. pt. 1, 190 (1878), has indicated, a species of *Lappula*.

4a. **P. penicillata**, var. **genuina**.—Ranging from British Columbia, Idaho and southwestern Wyoming southward to northern Nevada and Lower California. In Arizona, southern Nevada, and the deserts of California it is replaced by the following variety.

4b. **P. penicillata**, var. **heterocarpa**, var. nov., deserticola; nuculis heteromorphis, duabus marginatis, duabus emarginatis gracilioribus paullo reflexis.—ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G); Camp Grant, *Palmer 182* (G); near Camp Lowell, 1881, *Pringle* in part (G); without locality, 1876, *Palmer* (G). NEVADA: Moapa, *Goodding 2200* (G); St. Thomas, *Tidestrom 8642* (G). CALIFORNIA: Ft. Yuma, *Major Thomas* (G); (?) Colorado River, 1854, *Bigelow;* Coahuilla Valley, 1901, *Hall* (G); Surprise Canyon, Panamint Mts., *Coville & Funston 721* in part (G); Providence Mts., *Munz & Harwood*

3435 in part (P); near Daggett, *Munz & Harwood 3673* in part (P); north of Randsburg, 1922, *Pierce* (P); Corn Springs, Chuckawalla Valley, 1922, *Munz & Keck 4870* (TYPE, Pomona College Herb.); Chuckawalla Valley, *Munz & Keck 4804* in part (G); Paloverde Valley, 1905, *Wilder* (P); Palm Springs, *Spencer 115* (P). The following collections appear intermediate between var. *genuina* and var. *heterocarpa*. Hemet, *Baker 4139* (P); near Cabazon, *Munz, Street & Williams 2387* (P); Santa Susana Mts., *Brewer 210* (G); Oil City, *Heller 7586* (G).—The nutlets of this variety are dissimilar, two of each fruit usually being unmargined, thicker, and somewhat reflexed. The fruit borne about the base of the plant is different from that borne well out on the branches and perhaps is produced by cleistogamous flowers. The nutlets of this fruit are usually consimilar, all are strongly reflexed, very thickened, and broadly and permanently affixed to the gynobase. Similar fruit is found in the Chilian *P. gracilis*, var. *dimorpha*.

5. **P. pusilla** (A. DC.) Gray, Proc. Am. Acad. xii. 81 (1876). *Gruvelia pusilla* A. DC. Prodr. x. 119 (1846); Gay, Fl. Chile iv. 482, t. 52, fig. 3 (1849). *P. pusilla*, var. *flagillaris* Brand, Pflanzenr. iv. Fam. 252, i. 96 (1921).—West of the high mountains from southern Washington to middle (Fresno County) California; also in Chile where very rare. Brand, l. c., considers the North American plant varietally distinct from the South American, arguing that it has more slender, elongate stems. Though the northern material may frequently attain greater slenderness and height than the southern, the two are certainly indistinguishable at times.

6. **P. setosa** Gray, Proc. Am. Acad. xii. 81 (1876). *Gruvelia setosa* Rydb. Bull. Torr. Bot. Cl. xl. 479 (1913).—This species is confined to western North America and breaks up into three geographic varieties as follows:—

6a. **P. setosa**, var. **genuina**.—Washington and Idaho in the arid interior, southward into Utah and Arizona, and along the Sierras to the Mohave and northern Colorado Deserts. This is the common and typical phase of the species having two of the four nutlets winged, and two wingless with the latter pair partially hidden by the former.

6b. **P. setosa**, var. **aptera**, var. nov., australis; nuculis vix alatis vel omnino apteris.—CALIFORNIA: Warners Hot Spring, *Eastwood 2620* (G); dry canyon floor near Campo, 1903, *Abrams 3571* (TYPE, Gray Herb.).—The nutlets of this variety are quite similar to those of *P. pusilla*. The specimens referred here come from the western

side of the Colorado Desert and represent the only material of the species seen from the area.

6c. **P. setosa**, var. **holoptera**, var. nov., mohavensis; nuculis omnibus late aequaliterque alatis.—CALIFORNIA: White Mts. east of Laws, *Heller 8187* (G); Granite Wells, Mohave Desert, 1922, *Johnston 6489* (TYPE, Pomona College Herb.); near Mohave, 1920, *Johnston* (P); Mt. Pinos, *Hall 6423* (P).—This form, characterized by having all its nutlets broadly and equally winged, occurs along the northwest edge of the Mohave Desert.

17. **Omphalodes** Moench, Meth. 419 (1794).

KEY TO SPECIES.

Cauline leaves sessile, oblong-linear or lanceolate; corolla white; introduced plants.....1. *O. linifolia.*
Cauline leaves long-petiolate, blades more or less cordate; corolla blue or bluish; indigenous plants, mainly Mexican.
Flowers in naked racemes with only the lowermost if any bracteate; annual.....2. *O. aliena.*
Flowers all axillary; short-lived perennials.
Corolla large, 10–14 mm. broad; leaves herbaceous, lower ones 25–35 mm. broad.....3. *O. acuminata.*
Corolla small, 5–7 mm. broad; leaves firm, largest lower ones only 10–15 mm. broad.
Leaves with evident veining, sharply acute or acuminate, rather sparsely strigose; pedicels shorter or but little exceeding the bracts.....4. *O. cardiophylla.*
Leaves with obscured veining, broadly acute, velutinous with a dense short pubescence; pedicels twice exceeding the subtending leaves.....5. *O. mexicana.*

1. **Omphalodes linifolia** (L.) Moench, Meth. 419 (1794). *Cynoglossum linifolium* L. Sp. Pl. 134 (1753).—Native of southwestern Europe. Reported by Hooker, Fl. Bor. Am. ii. 86 (1838), from Labrador. Collected in 1919 on street parking in Salem, Oregon, by J. C. Nelson.

2. **O. aliena** Gray in Hemsl. Biol. Centr. Amer. Bot. ii. 377 (1882).—TEXAS: common, rocky hillsides, Sanderson, *H. C. Hanson 381.* NUEVO LEON: limestone hills near Monterey, 600 m. alt., *Pringle 10205, 10206;* Monterey, 1880, *Palmer 893* (TYPE).

3. **O. acuminata** Robins. Proc. Am. Acad. xxvi. 170 (1891).—NUEVO LEON: Sierra Madre near Monterey, *Pringle 2220* (TYPE); limestone ledges of Sierra Madre above Monterey, *Pringle 10162.*

4. **O. cardiophylla** Gray in Hemsley, Biol. Centr. Amer. Bot. ii. 377 (1882).—PUEBLA: Boca del Monte on shaded mountain slopes, *Purpus 2498.* COAHUILA: mountains near Saltillo, *Palmer 894* (TYPE).

5. **O. mexicana** Wats. Proc. Am. Acad. xxv. 158 (1890).—NUEVO LEON: fissures of dry lime rock, Sierra Madre near Monterey, *Pringle 1878* (TYPE).

18. **Harpagonella** Gray, Proc. Am. Acad. xi. 88 (1876).

Harpagonella Palmeri Gray, Proc. Am. Acad. xi. 88 (1876); Baill. Bull. Mens. Soc. Linn. Paris no. 102, 812 (1889); Hist. Pl. x. 351, fig. 266–8 (1890); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 130, fig. 53 (1891).—An anomalous monotype known only from Pima and Cochise counties in southern Arizona, extreme southwestern California in western San Diego and southwestern Riverside counties, extreme northwestern Lower California, and on the Guadelupe and Santa Catalina Islands.

19. **Myosotis** [Dill.] L. Sp. Pl. 131 (1753); Gen. Pl. 63 (1754).

KEY TO SPECIES.

Inflorescence leafy-bracted nearly throughout; corolla-tube at least a third longer than calyx; prostrate antarctic perennials.
Corolla white, limb ca. 4 mm. broad; pedicels equalling calyx and becoming 1–2 mm. long; nutlets ca. 1.8 mm. long, 1.2 mm. broad; plant sparsely short-hairy.....1. *M. albiflora.*
Corolla blue, limb ca. 2.5 mm. broad; calyx subsessile; nutlets ca. 1.3 mm. long, 0.8 mm. broad; plant long-hairy throughout.....2. *M. antarctica.*
Inflorescence naked or rarely with the lowermost flowers bracteate; corolla-tube little if at all exceeding calyx; mostly erect annuals.
Hairs on calyx few, short, straight, closely appressed, eglandular; aquatic or marsh plants.
Style commonly much exceeding the nutlets and about equalling calyx-tube; corolla large, 6–9 mm. broad; calyx-lobes commonly shorter than tube; inflorescence usually completely bractless; stems rather coarse, angled, usually ascending, stoloniferous at base..3. *M. scorpioides.*
Style clearly exceeded by nutlets and shorter than calyx-tube; corolla rather small, 3–6 mm. broad; calyx-lobes about equalling the tube; main branches of inflorescence bracted at base; stems slender, terete, branched at base, not stoloniferous.....4. *M. laxa.*
Hairs on at least basal portion of calyx uncinate or gland-tipped; plants of well drained soil.
Plants conspicuously densely retrorse-hirsute below, rather coarse and loosely decumbent; leaves broadly oblanceolate, contracted to a narrow well developed petiole..5. *M. azorica.*
Plants not conspicuously retrorse-hirsute, rather slender, mainly erect; leaves oblong or lanceolate, lacking well developed petioles.
Plants densely tufted; stems with loose papery sheaths at base; native alpine perennials.....6. *M. alpestris.*

Plants not densely tufted; stems without papery basal sheaths; annual or biennial plants of low altitudes.
Calyx very unequally cleft, usually distinctly 2-lipped; corolla inconspicuous, 1–2 mm. broad, white; native.....7. *M. virginica.*
Calyx about equally cleft, regular or nearly so; corolla inconspicuous to showy, 1.5–8 mm. broad; usually blue; introduced plants.
Corolla very conspicuous, 5–8 mm. broad; limb flat. 8. *M. sylvatica.*
Corolla small, 1.5–4 mm. broad; limb concave.
Pedicels equalling or exceeding length of calyx; calyx-lobes spreading.....9. *M. arvensis.*
Pedicels shorter than length of fruiting calyx; calyx-lobes erect.
Plant floriferous to near base, lower flowers among the leaves; corolla blue, tube about equalling calyx; style always shorter than nutlets.....10. *M. micrantha.*
Plant not floriferous to near base, flowers in naked racemes above the leaves; corolla at first yellow finally changing to blue, tube somewhat exceeding calyx; style frequently much surpassing nutlets....11. *M. versicolor.*

1. **Myosotis albiflora** Banks & Solander in Hook. f. Fl. Antarct. ii. 329 (1846). *Eritrichium albiflorum* Griseb. Abhandl. Ges. Wis. Goett. vi. 131 (1857). *Allocarya albiflora* Greene, Erythea iii. 57 (1895).—Endemic to the vicinity of the Straits of Magellan. In the literature this plant has been repeatedly confused with the plant recently called *Plagiobothrys Lechleri* Johnston. My knowledge of this *Myosotis* has been largely derived from Skottsberg, Svenska Vet. Akad. Handl. lvi. pt. 5, 290, t. 23, fig. 8a, c (1916), who besides discussing it has given figures and a new description.

2. **M. antarctica** Hook. f. Fl. Antarct. i. 57, t. 38 (1844). *M. antarctica,* forma *gracilior* Skotts. Svenska Vet. Akad. Handl. lvi. pt. 5, 291 (1916).—Extreme southern Patagonia; also in New Zealand and on the Stewart and Campbell Islands. The species has been confused with *M. albiflora.* Skottsberg, l. c., t. 23, fig. 8b, d, gives a few figures and a new description of the species.

3. **M. scorpioides** L. Sp. Pl. 131 (1753); Rendle & Brit. Jour. Bot. xlv. 440 (1907). *M. scorpioides,* var. *palustris* L. l. c. *M. palustris* Lam. Fl. Fr. ii. 283 (1778).—Native of Europe. Frequently cultivated. Naturalized in Newf.!, Que.!, N. S.!, Me.!, N. H.!, Vt.!, Mass.!, R. I., Conn.!, N. Y.!, N. J., Penn., Md.!, D. C., Ga., Mich.!, Tenn.!, La., Ont.!, Calif.!, B. C., Hidalgo.

4. **M. laxa** Lehm. Asperif. i. 83 (1818). *M. caespitosa,* var. *laxa* A. DC. Prodr. x. 105 (1846). *M. palustris,* var. *laxa* Gray, Manual

ed. 5, 365 (1867). *M. lingulata* Lehm. Asperif. i. 110 (1818). *M. caespitosa* Schultz, Fl. Starg. Suppl. i. 11 (1819). *M. palustris*, var. *micrantha* Lehm. in Hook. Fl. Bor. Am. ii. 81 (1838).—Newfoundland to Georgia, westward to Ontario and Tennessee; also on the Pacific Coast from California to British Columbia. Chile.

5. **M. azorica** H. C. Wats. Bot. Mag. lxx. t. 4122 (Nov. 1844). (?) *M. maritima* Hochst. in Seubert. Fl. Azor. 37 (1844).—AMERICA: Mill Valley, California, 1913, *Suksdorf 520* (G); Bogotá, Colombia, 1876, *Bayon* (US); canyon of La Paz River, Bolivia, *Shepard 174* (G); Valdivia, Chile, 1896, *Buchtien* (US).—Native of the Azores and Canary Islands. Cultivated in America and occasionally escaping. I have not examined any indubitable material of *M. maritima*, but Watson's note, Lond. Jour. Bot. vi. 388 (1847), would seem to indicate that *M. azorica* and *M. maritima* merely represent ecological phases of one species. The preface of Seubert's Flora Azorica is dated April 1844, and it hence seems probable that the name *M. maritima* has priority over *M. azorica*. However, due to my lack of precise knowledge of *M. maritima* I am treating the present species under the well understood name given by Watson. In Petard & Proust's flora of the Canaries, pg. 274, as well as in Bornmüller's list, Engler, Bot. Jahrb. xxxiii. 466 (1903), the present species is treated as *M. macrocalycina* Coss. *Myosotis macrocalycina* Coss., Batt. & Trab. Fl. Alg. i. 604 (1888–90), is a very closely related plant of northern Algeria, which has the pubescence and habit of *M. azorica* and appears to differ only in its slightly longer fruiting pedicels and larger fruiting calyces. It seems not at all improbable that *M. azorica* may have still earlier synonyms in *M. latifolia* Poir. Encyc. Suppl. iv. 45 (1816), or *M. oblongata* Link in Buch, Phys. Beschr. Can. Isl. 144 (1825). The original descriptions of these latter species are so brief as to be indefinite and a study of the types must precede an attempt at precisely settling their status. Both came from the Canary Islands.

6. **M. alpestris** Schmidt, Fl. Boehm. iii. 26 (1794); Schinz & Thell. Vierteljahrs. Naturf. Ges. Zürich lxviii. 469 (1923). *M. sylvatica*, var. *alpestris* Koch, Syn. Deutsch. Fl. 504 (1838). *M. pyrenaica*, var. *alpestris* Schinz & Thell. Vierteljahrs. Naturf. Ges. Zürich liii. 558 (1908). *M. olympica* Boiss. Diagn. ser. 1, pt. 4, 50 (1844). *M. rupicola* Smith, Eng. Bot. xxxvi. t. 2559 (1814).—Arctic-alpine situations from Alaska and the lower Mackenzie River Valley, southward along the Rocky Mountains to Colorado and Oregon (acc. Howell); also in the higher mountains of Europe. Many writers consider this plant to be only a phase of *M. sylvatica*, but in the

American and European material available it seems quite distinct in its very densely tufted, very scaly, perennial base, and arctic-alpine range. The garden plants current as *M. alpestris* are horticultural forms of *M. sylvatica.*

7. **M. virginica** (L.) BSP. Prel. Cat. N. Y. 37 (1888). *Lycopsis virginica* L. Sp. Pl. 139 (1753). *M. verna* Nutt. Gen. ii. add. (1818). *M. macrosperma* Engelm. Am. Jour. Sci. ser. 1, xlvi. 98 (1844). *M. verna*, var. *macrosperma* Chap. Fl. South. U. S. 333 (1860). *M. virginica*, var. *macrosperma* Fernald, Rhodora x. 55 (1908). *M. inflexa* Engelm. l. c.—Maine to Florida, west to Ontario and Texas; reappearing in Idaho, Oregon, Washington, and British Columbia. In the South and West the plants tend to grow more rankly and to have the fruiting calyces over, rather than under 5 mm. in length; this coarser plant is the var. *macrosperma.*

8. **M. sylvatica** Hoffm. Deutsch. Fl. ed. 1, 61 (1791).—Native of Europe. This is the common forget-me-not of the garden of which there are a number of horticultural strains. It frequently escapes, as for instance in Newf.!, Que.!, N. H.!, Vt.!, Mass.!, Mich.!, and Calif.!

9. **M. arvensis** (L.) Hill, Veg. Syst. vii. 55 (1764); Schinz & Thell. Bull. Herb. Boiss. ser. 2, vii. 339 (1907). *M. scorpioides*, var. *arvensis* L. Sp. Pl. 131 (1753). *M. intermedia* Link in Schultz, Fl. Starg. suppl. i. 12 (1819).—Native of Europe. Introduced in Newf.!, Que.!, N. B.!, N. S.!, Me.!, Vt.!, Mass.!, R. I.!, Conn.!, N. Y.!, Ohio!, Ore.!, B. C.

10. **M. micrantha** Pall. in Lehm. Neue Schr. Naturf. Ges. Halle iii. pt. 2, 24 (1817); Schinz & Thell. Bull. Herb. Boiss. ser. 2, vii. 339 (1907). *M. arenaria* Schrader in Schultz, Fl. Starg. suppl. i. 12 (1819). *M. stricta* Link in R. & S. Syst. iv. 104 (1819).—Native of Europe. Introduced in N. H.!, Mass.!, N. Y.!, N. J.!, Ohio!, Ind.!, Ont.!

11. **M. versicolor** (Pers.) Smith, Eng. Bot. xxxvi. sub. t. 2558 (1814); l. c. vii. t. 480, fig. 1 (1798). *M. arvensis*, var. *versicolor* Pers. Synop. i. 156 (1805). *Anchusa lutea* Cav. Icones i. 50, t. 69, fig. 1 (1791), excl. syn. (?) *M. lutea* Pers. l. c., not Lam. (1778); Schinz & Thell. Bull. Herb. Boiss. ser. 2, vii. 338 (1907); Rendle & Brit. Jour. Bot. xlv. 440 (1907).—Native of Europe. Introduced in Que.?, Mass.!, Del.!, Ore.!, B. C.

12. **M.** sp. indet.—There is a specimen in the Gray Herbarium collected July 2, 1912 by C. K. Dodge in partially shaded high ground on Mackinac Island, Port Huron, Mich., which in gross aspect suggests *M. sylvatica*, but has white corollas with concave limb 3–5 mm. broad, and leaves rather sharply acute. It also suggests *M. virginica*

but differs in its large corollas, long spreading pedicels, and more loosely branched slender stems. More material of this form is desired and particularly information as to whether it be a native or escaped garden plant. The plant appears to be an undescribed species, but to describe it upon the data available seems entirely inadvisable.

20. **Cerinthe** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

Cerinthe major L. Sp. Pl. 136 (1753).—Native of the Mediterranean region. Occasionally cultivated. Found escaping from a garden in Quebec by A. S. Pease in 1904.

21. **Asperugo** [Tourn.] L. Sp. Pl. 138 (1753); Gen. Pl. 67 (1754).

Asperugo procumbens L. Sp. Pl. 138 (1753).—Native of Eurasia. An infrequent introduction. Known from Mass.!, N. Y., N. J.!, Penna.!, Del.!, D. C.!, Ohio, Minn., Alb., Utah!, Ore.!, Wash., B. C.

22. **Amsinckia** Lehm. Delect. Sem. Hort. Hamburg 7 (1831).

Benthamia Lindl. Nat. Syst. 241 (1830).—A review of the Amsinckias north of Mexico has been published by Macbride, Contr. Gray Herb. n. s. xlix. 1–16 (1917). The genus consists of three very pronounced series. Of these Macbride has succeeded in giving a satisfying elucidation of the two with lustrous and tessellate nutlets. The third and largest series, that with dull rugose nutlets, deserves further study though from its exceptional and baffling complexity there seems little hope that students can ever arrive at agreement regarding its treatment. The South American species of *Amsinckia* belong to the last section and need careful study. Superficially, however, the southern plants belong to a single species, the bibliography of which is as follows.—AMSINCKIA ANGUSTIFOLIA Lehm. Delect. Sem. Hort. Hamburg 7 (1831); Bettfr. Fl. Argent. iii. 177, t. 108 (1901). *Benthamia angustifolia* Druce, List Brit. Pl. 103 (1908). *Lithospermum calycinum* Moris, Mem. Acad. Torino xxxvii. 98, t. 22 (1833). *L. chilense* Colla, Mem. Acad. Torino xxxviii. 127 (1834). *A. parviflora* Bernh. Del. Sem. Hort. Erf. (1833). *A. angustifolia*, var. *pseudolycopsioides* Colla in Gay, Fl. Chile iv. 473 (1849). *A. pseudolycopsioides* Speg. Anal. Soc. Cient. Argent. liii. 137 (1902). *A. basistaminea* Cesati, Atti Acc. Sc. Nap. ser. 5, vii. 14 (1873). *B. basistaminea* Druce, Rep. Exch. Cl. Brit. Isl. iv. 298 (1916). *Eritrichium Mandonii* Ball, Jour. Linn. Soc. Bot. xxii. 51 (1885).

There is a species of doubtful status reported from Mexico. This

is *A. mexicana* Mart. & Gal. Bull. Acad. Brux. xi. 339 (1844), which is said to have come from near Morelia, Michoacan. I have seen no specimens of the species nor of any other *Amsinckia* coming from central or southern Mexico, nor is there, according to Mr. Paul C. Standley, any material of *Amsinckia* in the United States National Herbarium coming from that region. The plant is described as having corollas plicate in the throat which suggests that it may prove to be a *Heliotropium*.

23. **Selkirkia** Hemsley, Bot. Challenger i. pt. 3, 47 (1884).

Selkirkia Berteri (Colla) Hemsley, Bot. Challenger i. pt. 3, 48, t. 57 (1884); Brand, Pflanzenr. iv. Fam. 252, i. 16 and 163 (1921); Skottsberg, Nat. Hist. Juan Fernandez ii. 163 (1921). *Cynoglossum Berteri* Colla, Mem. Acad. Torino xxxviii. 132, t. 43 (1834).—A shrub endemic to Masatierra of the Juan Fernandez Islands. The genus is monotypic and very distinct, appearing to be most related to *Hackelia*.

24. **Cryptantha** Lehm. in F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1835).

Krynitzkia F. & M. l. c. vii. 52 (1841). *Piptocalyx* Torr. in Wats. Bot. King Exped. 240 (1871), not Oliver (1870); Johnston, Contr. Gray Herb. n. s. lxviii. 55 (1923). *Eremocarya* Greene, Pittonia i. 58 (1887); Johnston, l. c. 56. *Greenocharis* Gürke & Harms in E. & P. Nat. Pflanzenf., Gesamtreg. 462 (1899). *Wheelerella* Grant, Bull. So. Calif. Acad. v. 28 (1906).—This is the largest and most difficult genus among the American members of the subfamily. It is restricted to America and has two definite centers, one in western United States and the other in middle and northern Chile. A critical descriptive monograph of the North American species is in preparation. The South American species, all different from those north of the Equator, are in distressing need of attention, but their satisfactory elucidation must await the attention of the student who can study them in the field and have access to Philippi's types at Santiago, Chile. Reiche, Fl. Chile v. 217–236 (1910), has given most of the bibliography and a rough classification of the very numerous Chilian species. The treatment while difficult of use is nevertheless very valuable in showing the probable status and relationships of most of Philippi's briefly described species. The following species from Peru appear never to have been properly named under *Cryptantha*.

Cryptantha limensis (A. DC.), comb. nov., based on *Eritrichium limense* A. DC., Prodr. x. 133 (1846), had its type collected at Lima, Peru. This has oblong obtuse leaves, leafy spikes, coarsely hirsute calyx-lobes, and inconspicuous tubular corollas. *Cryptantha granulosa* (R. & P.) Johnston is the only other member of the genus described from Peru, although material recently received from that country seems to contain several additional species, all undescribed.

25. **Oreocarya** Greene, Pittonia i. 57 (1887).

This group has been recently revised by Macbride, Contr. Gray Herb. xlviii. 20–38 (1916). It may be strongly questioned whether it is generically distinct from *Cryptantha*, particularly so when the South American members of the latter genus are considered. No one has yet pointed out characters for *Oreocarya* which are consistently diagnostic, nor has a rather superficial search on my part resulted in the discovery of any. The group is maintained here as a genus pending detailed studies to be reported on later.

26. **Plagiobothrys** F. & M. Ind. Sem. Hort. Petrop. ii. 46 (1835).

Echidiocarya Gray, Proc. Am. Acad. xi. 89 (1876). *Sonnea* Greene, Pittonia i. 22 (1887). *Allocarya* Greene, Pittonia i. 12 (1887).—For a synopsis of this genus see Johnston, Contr. Gray Herb. n. s. lxviii. 57–80 (1923).

27. **Mertensia** Roth, Cat. Bot. i. 34 (1797).

Pneumaria Hill, Veg. Syst. vii. 40 (1764).—Macbride, Contr. Gray Herb. n. s. xlviii. 1–20 (1916), has recently revised the true Mertensias of western America. Bibliography and descriptions of the relatively few species left untreated by Macbride may be found by consulting Gray, Synop. Fl. N. Am. ii. pt. 1, 199–201 (1878), and Britton & Brown, Illust. Fl. ed. 2, iii. 82–83 (1913). In the past the genus has been almost always referred to the tribe *Lithospermeae*, but the attachment of its nutlets and its simple stigma clearly point to a relationship among the *Eritrichieae*. Suggestive also of this latter relationship is the consistently boreal distribution, the *Lithospermeae* being a prevailingly austral group.

28. **Trigonotis** Stev. Bull. Soc. Nat. Moscou xxiv. 603 (1851).

Trigonotis peduncularis (Trev.) Benth. Jour. Linn. Soc. xvii. 384 (1879). *Myosotis peduncularis* Trev. Mag. Ges. Nat. Fr. Berlin vii. 147, t. 2, fig. 6–9 (1816). *Eritrichium pedunculare* A. DC. Prodr. x. 128 (1846).—Native from extreme southeastern Europe through middle and northern China to Japan. Although apparently hereto-

fore unreported from America, this species was collected July 12, 1893 in the vicinity of Nanaimo, Victoria Island, British Columbia, by John Macoun (no. *694*) and distributed as *Myosotis arvensis*. It is a roadside weed in Asia and probably introduced in America in ballast.

29. **Lappula** Moench, Meth. 416 (1794).

Echinospermum Sw. in Lehm. Asperif. i. 113 (1818). *Staurina* Nutt. Jour. Acad. Philad. i. 182 (1848)

Key to Species and Varieties.

Nutlets with marginal prickles in at least two rows.
  Fruit in situ ca. 3 mm. high; nutlets with dorsal granulations uniform; introduced plants ..... 1. *L. echinata.*
  Fruit in situ 4–5 mm. high; nutlets with dorsal granulations high towards middle and low towards sides; plants native of western United States.
    Plant suffruticose, bushy-branched, green; pubescence short, appressed, sparse; fruit in situ ca. 5 mm. high ... 2. *L. cenchrusoides.*
    Plant entirely herbaceous, usually branched above and strict, canescent; pubescence rather long and loose; fruit in situ ca. 4 mm. high ..... 3. *L. Fremontii.*
Nutlets with marginal prickles definitely in a single row.
  Marginal prickles distinct to base or nearly so, not confluent to form a cupulate structure.
    Style exceeded by nutlets; margin of nutlets unarmed or with short obscure glochids ..... 4. *L. brachystyla.*
    Style surpassing nutlets; margin of nutlets with conspicuous well developed prickles ..... 5. *L. Redowskii.*
      Tubercules on nutlets numerous, not in regular longitudinal rows; native of western America ..... var. *occidentalis.*
      Tubercules on nutlets few, arranged in regular longitudinal rows; ballast plants native of Eurasia ..... var. *patula.*
  Marginal prickles confluent, forming a conspicuous cupulate structure on back of some or all the nutlets ..... 6. *L. texana.*
    Nutlets heteromorphous, one or two with distinct prickles and not with a cupulate margin.
      Plant erect, branched above, tall ..... var. *genuina.*
      Plant decumbent or ascending, branched at base, low. var. *heterosperma.*
    Nutlets homomorphous, all with confluent prickles and hence a cupulate margin.
      Cupulate margin narrow, spreading.
        Plant branched above; pubescence villous ..... var. *columbiana.*
        Plant branched at base; pubescence harsh ..... var. *foliosa.*
      Cupulate margin deep, inflexed.
        Anterior parts of nutlets tuberculate ..... var. *homosperma.*
        Anterior parts of nutlets smooth ..... var. *coronata.*

1. **Lappula echinata** Gilib. Fl. Lith. i. 25 (1781). *Myosotis Lappula* L. Sp. Pl. 131 (1753). *Echinospermum Lappula* Lehm. Asperif. i. 121 (1818). *L. Lappula* Karst. Deutsch. Fl. 979 (1880–83).—Native of Eurasia. Introduced in Newf.!, Que.!, P. E. I.!, N. B.!, N. S.!,

Me.!, N. H.!, Vt.!, Mass.!, R. I., Conn.!, N. Y.!, N. J.!, Penn., Ont.!, Ind.!, Mich.!, Wis.!, Ill.!, Minn.!, Mo.!, N. D.!, S. D.!, Neb.!, Kan., Tex., Alb.!, Calif., B. C.!, Alaska!

2. **L. cenchrusoides** Nels. Bull. Torr. Bot. Cl. xxvi. 243 (1899); Nels. & Macbr. Bot. Gaz. lxi. 38 (1916).—A local species known only from southeastern Wyoming. Characterized by its habit and very large fruit.

3. **L. Fremontii** (Torr.) Greene, Pittonia iv. 96 (1899); Nels. & Macbr. Bot. Gaz. lxi. 37 (1916). *Echinospermum Fremontii* Torr. Pacif. R. R. Rep. xii. pt. 2, 46 (1860). *L. erecta* Nels. Bull. Torr. Bot. Cl. xxvii. 268 (1900).—Assiniboia to Wyoming, Utah, and Idaho. As here used the binomial covers the plant originally described, namely Suckley's collection from the "Upper Missouri River." The collection made by Fremont, which was originally cited and from which the species apparently got its name, is probably *L. Redowskii*, var. *occidentalis* inasmuch as the specimen is given as having come from the southern Sierra Nevada where only the latter species is known to occur. There are hence good reasons for considering the Fremont collection as the type of *L. Fremontii* and for referring the species to synonymy under the variety of *L. Redowskii*. Indeed I should be inclined to do this were the status of the alternate name, *L. erecta*, an unclouded one. Nelson & Macbride, l. c., say "*L. erecta* is clearly a synonym" of *L. Fremontii* as here accepted, yet in the original description of the former the nutlets are described as having "a single marginal series of about 10 aculeae," whereas the plant concerned has numerous aculeae in several series.

4. **L. brachystyla** (Gray) Macbr. Contr. Gray Herb. n. s. xlviii. 40 (1916). *Echinospermum brachycentrum*, var. *brachystylum* Gray, Proc. Am. Acad. xxi. 413 (1886).—Known only from the type collected in 1885 at Spence's Bridge, Thompson River, in southern British Columbia. The species is very distinct among the American representatives of the genus.

5a. **L. Redowskii** (Hornem.) Greene, var. **occidentalis** (Wats.) Rydb. Contr. U. S. Nat. Herb. iii. 170 (1895); Nels. & Macbr. Bot. Gaz. lxi. 38 (1916). *Echinospermum Redowskii*, var. *occidentale* Wats. Bot. King Exped. 246, t. 23, fig. 9–10 (1871). *L. occidentalis* Greene, Pittonia iv. 97 (1899). *Cynoglossum pilosum* of Nutt. Gen. i. 114 (1818); not R. & P. (1799); T. & G. Pacif. R. R. Rep. ii. 171 (1855) and Nutt. Jour. Acad. Philad. i. 182 (1848). *L. Redowskii*, var. *pilosum* MacMill. Metasp. Minn. Valley 441 (1892). *L. pilosa* Hitchc. Spr. Fl. Manhattan 30 (1894). *C. Nuttallii* Spreng. Syst. i.

566 (1825). *Pectocarya lateriflora*, var. *Nuttallii* Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), name only. *E. strictum* Nees in App. Neuwied, Trav. 17 (1841), not Ledeb. (1829). *E. Redowskii*, var. *strictum* Wats. l. c. 247, name only. (?) *E. pilosum* Buckl. Proc. Acad. Philad. 1861, 462 (1861). (?) *L. montana* Greene, Pittonia iv. 96 (1899). *L. calycosa* Rydb. Bull. Torr. Bot. Cl. xxviii. 30 (1901). *E. patagonicum* Speg. Anal. Soc. Cient. Argentina liii. 79 (1902). *L. patagonica* Druce, Rep. Bot. Exch. Cl. Brit. Isl. iv. 630 (1917). *L. leucotricha* Rydb. Bull. Torr. Bot. Cl. xxxvi. 676 (1909).—Native of Asia and America. In the New World occurring in Patagonia and from Saskatchewan, North Dakota, Oklahoma, and New Mexico westward. Extending northward to Alaska. In United States introduced east of its natural range in Me.!, Mass.!, Mich.!, Wis.!, Minn.!, and Mo.!

5b. **L. Redowskii**, var. **patula** (Lehm.) Nels. & Macbr. Bot. Gaz. lxi. 39 (1916). *Echinospermum patulum* Lehm. Asperif. i. 124 (1818). —Native of southeastern Europe and adjacent Asia. Occasional in America as a ballast plant, and known from Penn.!, and Ore.! I am not thoroughly satisfied that this introduced plant can always be separated from indigenous material by the characters given in the key.

6a. **L. texana**, var. **genuina**. *L. texana* (Scheele) Britt. Mem. Torr. Bot. Cl. v. 273 (1894); Nels. & Macbr. Bot. Gaz. lxi. 40 (1916). *Echinospermum texanum* Scheele, Linnaea xxv. 260 (1852). *E. Redowskii*, var. *cupulatum* Gray, Bot. Calif. i. 530 (1876). *L. cupulata* Rydb. Bull. Torr. Bot. Cl. xxviii. 31 (1901). *E. cupulatum* K. Schum. in Just, Jahresb. xxix. pt. 1, 564 (1903). *L. Redowskii*, var. *cupulatum* Jones, Bull. Univ. Montana xv. 44 (1910). *E. scabrosum* Buckl. Proc. Acad. Philad. 1861, 462 (1861).—This, the typical form of the species, is most common and apparently centers in Texas, and from there extends northward through Kansas to North Dakota, and southward into Coahuila. A discussion of the application of the name *L. cupulatum* will be found under *L. texana*, var. *columbiana*. In desperation I refer two puzzling collections to the present variety; these are *Goodding 1010* from Modena, Utah, and *Macbride & Payson 948* from the Grand Canyon, Arizona. Most of the fruits on these collections have heteromorphous nutlets and most of the latter have conspicuous margins which are high about the base of the nutlets and very low or absent about the tip. Confusing is the fact that the later fruit produced by these plants appears to be practically homomorphous and quite like that produced in *L. Redowskii*, var. *occidentalis*. It becomes a question, therefore, as to what should be done with the

collections and just how they affect the validity of *L. texana.* The status of that species having previously been none too satisfactory these collections have made me strongly consider reducing it to varietal rank under *L. Redowskii.* Since, however, the specimens may be abnormal or possibly of hybrid origin, pending the receipt of new data or specimens, I am for the present offering no solution of the problem and am not considering the matter in relation to the distinctness of *L. Redowskii* and *L. texana.*

6b. **L. texana,** var. **heterosperma** (Greene) Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. heterosperma* Greene Pittonia iv. 94 (1899). (?) *L. desertorum* Greene, l. c. 95. *L. cucullata* Nels. Bot. Gaz. xxxiv. 29 (1902)—Western and middle southern Colorado northward to western Wyoming. Readily distinguished from var. *genuina* by its low bushy habit and different range.

6c. **L. texana,** var. **columbiana** (Nels.), comb. nov. *L. columbiana* Nels. Bot. Gaz. xxxiv. 28 (1902). *L. infelix* Greene, Pittonia iv. 235 (1901). (?) *L. anoplocarpa* Greene, Ottawa Nat. xvi. 39 (1902). *L. cupulata* of Nels. & Macbr. Bot. Gaz. lxi. 39 (1916), and most authors.—Washington, northern Idaho, and northern Oregon. This plant has the habit of var. *genuina,* but has different nutlets and a widely different range. Most authors have maintained it as a distinct species, but it seems to intergrade with the var. *homosperma* through the var. *foliosa.* Nelson & Macbride, l. c., Piper, Contr. U. S. Nat. Herb. xi. 475 (1906), and Rydberg, Fl. Rocky Mts. 717 (1917), have treated the present plant as *L. cupulata,* typifying it by the specimen from Trinity Mountains, Nevada, cited by Watson, Bot. King Exped. 247 (1871), under "*Echinospermum Redowskii,* var. *strictum.*" It is not clear why *L. cupulatum* has been so typified. The plant treated by Watson is what is here called *L. texana,* var. *columbiana,* but Watson's trinomial, *E. Redowskii,* var. *strictum,* is evidently based upon *E. strictum* Nees, Append. Neuwied, Trav. 17 (1841), which originally came from the upper Missouri River and appears to be *L. Redowskii,* var. *occidentalis.* In the Botany of California, i. 530 (1876), Gray proposed a new trinomial, *E. Redowskii,* var. *cupulatum,* apparently because Nees's binomial was antedated by one of Ledebour's. Under the new name Gray cited Watson's trinomial and Nees's binomial, clearly showing thereby that he considered them synonymous. Gray's description and the meaning of his varietal name, however, clearly apply to a plant different from that properly covered by the names he cites. When the variety was proposed Gray had six, or possibly seven, specimens that he referred to it. Of this suite three, or possibly four

specimens, are *L. texana*, var. *genuina*, one is *L. texana*, var. *heterosperma*, one is *L. texana*, var. *foliosa*, and one is the plant here called *L. texana*, var. *columbiana*. It hence appears that *E. Redowskii*, var. *cupulatum* Gray is best treated, not as synonymous with *E. strictum* Nees (and consequently a synonym of *L. Redowskii*, var. *occidentalis*), but as synonymous with *L. texana*, var. *genuina* which includes the bulk of the original material cited by Gray and which is most appropriately covered by his varietal name.

6d. **L. texana**, var. **foliosa** (Nels.), comb. nov. *L. desertorum*, var. *oliosa* Nels. Bull. Torr. Bot. Cl. xxvii. 267 (1900). *L. foliosa* Nels. Man. Rocky Mt. Bot. 413 (1909). *L. cupulata*, var. *foliosa* Nels. & Macbr. Bot. Gaz. lxi. 40 (1916).—Plains of southern Idaho and adjacent Wyoming and Oregon.

6e. **L. texana**, var. **homosperma** (Nels.) Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. heterosperma*, var. *homosperma* Nels. Bot. Gaz. xxxiv. 29 (1902). (?) *L. montana* Greene, Pittonia iv. 96 (1899).—Alberta southward to Colorado.

6f. **L. texana**, var. **coronata** (Greene) Nels. & Macbr. Bot. Gaz. lxi. 41 (1916). *L. coronata* Greene, Pittonia iv. 94 (1899).—Southern Arizona.

30. **Eritrichium** Schrad. in Gaud. Fl. Helv. ii. 57 (1828).

Eritrichum Schrad. Comm. Goett. iv. 186 (1820), hyponym.

Key to Species and Varieties

Plant closely strigose; pubescence of leaves not projecting beyond apex as a conspicuous tuft; corolla 7–13 mm. broad.
Nutlets bordered with jagged teeth; plant green, with a rather sparse pubescence; Alaska and Yukon Territory.....1. *E. splendens.*
Nutlets bordered with a low unarmed rim; plant canescent, with a dense pubescence; Montana to Washington....2. *E. Howardi.*
Plant loosely villous; pubescence on leaves projecting beyond apex as a conspicuous tuft; corolla 1–7 mm. broad.
Margin of nutlets with very elongate teeth, the latter about equalling length of body of nutlet; arctic.....3. *E. aretioides.*
Margin of nutlets even, or with teeth much shorter than body of nutlet; montane.
Dorsal margin of nutlet even.....4. *E. elongatum.*
Dorsal margin of nutlet toothed.....var. *argenteum.*

1. **Eritrichium splendens** Kearney in Wight, Bull. Torr. Bot. Cl. xxix. 410, fig. C (1902).—Alaska: Old Man Creek, 1901, *Mendenhall* (type, US). Yukon: long. 141° lat. 62° 5′, alt. 1800 m., *Cairnes 85868* (G).—A very distinct species which in habit suggests the species related to *E. rupestris* (Pall.) Bunge. It is known only from Alaska and adjacent Yukon.

2. **E. Howardi** (Gray) Rydb. Mem. N. Y. Bot. Gard. i. 327 (1900). *Cynoglossum Howardi* Gray, Synop. Fl. N. Am. ii. pt. 1, 188 (1878). *Omphalodes Howardi* Gray, l. c. 423 (1886).—The collections cited by Wight, Bull. Torr. Bot. Cl. xxix. 410 (1902), and by Rydberg, l. c., in addition to that preserved in the Gray Herbarium, shows the species to center on the eastern slope of the cordilleras in western Montana. It extends southward, according to Dr. Rydberg *in lit.*, at least to the east slope of the Big Horn Mts. in northern Wyoming. The species is reported from the Cascade Mts. upon the basis of a collection by Tweedy, but its occurrence in western Washington seems incongruous with its indubitable range, and perhaps Tweedy's specimen was attributed to the Cascades through mislabeling.

3. **E. aretioides** (Cham.) A. DC. Prodr. x. 125 (1846); Kurtz, Engler Bot. Jahrb. xix. 471 (1894). *Myosotis aretioides* Cham. Linnaea iv. 443 (1829). *E. nanum*, var. *aretioides* Herder, Act. Hort. Petrop. i. 535 (1871–72). *Omphalodes nana*, var. *aretioides* Gray, Proc. Am. Acad. xx. 263 (1885). *E. Chamissonis* A. DC. l. c. *E. nanum*, var. *Chamissonis* Herder, l. c. *O. nana*, var. *Chamissonis* Gray, l. c.—Like Macbride, Contr. Gray Herb. n. s. xlviii. 50 (1916), I am unable to maintain *E. Chamissonis* as distinct from *E. aretioides*. The differences pointed out by Wight, Bull. Torr. Bot. Cl. xxix. 408 (1902), appear to be merely ecological. The species is known only from the vicinity of Bering Sea.

4. **E. elongatum** (Rydb.) Wight, Bull. Torr. Bot. Cl. xxix. 408, fig. D (1902). *E. aretioides*, var. *elongatum* Rydb. Mem. N. Y. Bot. Gard. i. 327 (1900). *Oreocarya pulvinata* Nels. Bot. Gaz. xl. 63 (1905).—Mountains from Montana to Idaho and eastern Oregon, southward to Utah and northern New Mexico. It is uncommon in the southern part of its range being largely replaced by the var. *argenteum*. As Macbride, Contr. Gray Herb. n. s. xlviii. 50 (1916), has pointed out, *Eritrichium elongatum* is very closely related to the European *E. nanum* (All.) Schrad. The only constant difference that I can detect is that the American plant is notably more canescent than its European congener. The differences in nutlets mentioned by Macbride, I fail to find. European plants vary greatly in the development of the dorsal rimming on the nutlets and seem to duplicate all the variations of this structure produced by the American relative. It can be said that *E. nanum* has a larger and less variable corolla than *E. elongatum*. On Pikes Peak, Colorado, the latter species is abundant on the alpine sward and shows a complete lack of

constancy in corolla-size, the corolla varying from 1–6 mm. in breadth without any particular size predominating.

4a. **E. elongatum**, var. **argenteum** (Wight), comb. nov. *E. argenteum* Wight, Bull. Torr. Bot. Cl. xxix. 411, fig. F (1902).—Most abundant in the mountains of Colorado, particularly in the southern part. It differs from the typical phase of the species only in having the margin of its nutlets jaggedly toothed.

31. **Hackelia** Opiz in Bercht. Fl. Boehm. ii. pt. 2, 146 (1839).

The bibliography and status of this genus was recently reviewed by Johnston, Contr. Gray Herb. n. s. lxviii. 43–48 (1923). Descriptions and keys for most of the species may be found in the basic paper by Piper, Bull. Torr. Bot. Cl. xxix. 535–549 (1902).

Excluded and unidentified names.

Anchusa depressa Sesse & Moc. Pl. N. Hisp. 21 (1887).—"Habitat in Uruapam" [Michoacan, Mexico].= Heliotropium limbatum Benth.

Anchusa incana Sesse & Moc. Fl. Mex. 30 (1894).—"Nascitur Quauhnahuacae agris" [(?) Cuernavaca, Morelos, Mexico]. Identity wholly obscure.

Antiphytum mexicanum DC. Prodr. x. 121 (1846).—"In Mexico in Chilpansigi circuitibus" [Guerrero, Mexico]. = Heliotropium calcicola Fernald.

Batschia albiflora Raf. New Fl. N. Am. pt. 4, 19 (1836).—"On the River Arkanzas on sand bars." = *Euploca convolvulacea* Nutt. (1837), and should therefore bear the name **Euploca albiflora** (Raf.), comb. nov.

Cerinthe lanceolata Sesse & Moc. Pl. N. Hisp. 20 (1887).—"Habitat Quahunahuacae" [(?) Cuernavaca, Morelos, Mexico]. This has a synonym in *Heliotropium lancifolium* Sesse & Moc. (1894), but both species are quite obscure.

Eritrichium pampeanum Speg. Fl. Ventana 44 (1896).—Sierra de la Ventana, prov. of Buenos Aires, Argentina. Spegazzini, Rev. Fac. Agron. et Veternar. iii. 551 (1897), says regarding *E. albiflorum* (B. & S.) Griseb. (= *Plagiobothrys Lechleri* Johnston), "species habitu *E. pampeano* Speg. sat. similis atque valde affinis." *Eritrichium pampeanum* is described as having subtrigonous smooth shiny nutlets that are completely bordered by an entire coriaceous-membranous ridge or crest. I know of no *Plagiobothrys* with such nutlets and suspect that Spegazzini's plant is a *Cryptantha*.

Lithospermum aggregatum R. & P. Fl. Peruv. ii. 4 (1799).—"Habitat in collibus aridis Tarmae et Huanuci" [Peru]. = COLDENIA PARONYCHIOIDES Phil.

Lithospermum angustifolium Sesse & Moc. Fl. Mex. 29 (1894); not Michx. (1803).—"Habitat in Oppido Ario" [Michoacan, Mexico]. This species has an earlier synonym in L. ROSMARINIFOLIUM Sesse & Moc. (1887); not Tenore (1826), but neither species has been recognized.

LITHOSPERMUM CILIATUM Raf. New Fl. N. Am. pt. 4, 18 (1836).—"Found by Hart on the Red River and by Drummond in Texas." Unrecognized but probably belonging in *Lithospermum* or *Oreocarya*.

Lithospermum cuneifolium Pers. Synop. i. 158 (1805). Based upon L. INCANUM R. & P. (1799).

LITHOSPERMUM CUSPIDATUM Raf. New Fl. N. Am. pt. 4, 18 (1836).—"In Alabama and Georgia." The identity of this species is wholly obscure.

Lithospermum dichotomum R. & P. Fl. Peruv. ii. 5, t. 111c (1799).—"Habitat Peruviae arenosis, versus Lurin, prope castrum Pachacamac." = COLDENIA DICHOTOMA (R. & P.) Lehm.

LITHOSPERMUM FLORIDANUM Raf. New Fl. N. Am. pt. 4, 18 (1836).—"In Florida." Seeds said to be pilose, and hence perhaps a *Heliotropium*.

LITHOSPERMUM FLAVUM Sesse & Moc. Fl. Mex. 30 (1894).—"Habitat in montibus *Zitácuáro* inter et *Malacatepec* interjectis" [Michoacan, Mexico]. Wholly obscure.

Lithospermum gracile Raf. New Fl. N. Am. pt. 4, 17 (1836).—"Sent me from Alabama and found on Red River Arkansas and Texas." = HELIOTROPIUM TENELLUM (Nutt.) Torr.

LITHOSPERMUM INCANUM R. & P. Fl. Peruv. ii. 4 (1799).—"Habitat in Peruviae collibus aridis versus Tarmae oppidum." Probably a *Lithospermum* and perhaps *L. peruvianum* A. DC.

LITHOSPERMUM OBTUSIFLORUM Sesse & Moc. Fl. Mex. 29 (1894).—"Habitat in montibus Oppido de *El Valle*" [(?) state of Mexico]. Wholly obscure.

LITHOSPERMUM ROSMARINIFOLIUM Sesse & Moc. Pl. Nov. Hisp. 20 (1887); not Tenore (1826).—"Habitat in Oppido Ario" [Michoacan, Mexico]. Unrecognized.

Lithospermum tenellum Nutt. Trans. Am. Philos. Soc. ser. 2, v. 188 (1837).—"In the prairies of Red River." = HELIOTROPIUM TENELLUM (Nutt.) Torr.

LYCOPSIS AXILLARIS Raf. New Fl. N. Am. pt. 4, 19 (1836).—"Found in Florida." Identity wholly obscure.

Myosotis cymosa Nutt. in Hook. Kew Jour. Bot. iii. 294 (1851); nom. nud.

MYOSOTIS GRANDIFLORA HBK. Nov. Gen. et Sp. iii. 90, t. 199 (1818).—"Crescit in Regno Quitensi, inter Tiscan et Alausi" Ecuador. Perhaps a *Lithospermum*.

MYOSOTIS MEXICANA Sesse & Moc. Fl. Mex. 31 (1894).—"Habitat in temperatis N. Hispan. montibus." Probably *Heliotropium calcicola* Fernald.

MYOSOTIS SERICEA Nutt. in Hook. Kew Jour. Bot. iii. 295 (1851), nom. subnud.—"On the hills of the Upper Platte River." = *Oreocarya* sp.

MYOSOTIS URUGUAYENSIS Arechav. Anal. Mus. Nat. Montevid. ser. 2, i. 68, fig. 4 (1911); Fl. Urug. iv. 180, fig. 12 (1911).—Dept. of Tacuarembo, Uruguay. Unrecognized.

ONOSMODIUM ERIOCAULON A. DC. Prodr. x. 70 (1846).—"In Mexico ad Cordilleram Guchilaqua." Described from *Berlandier 1020*, material past flowering. It is probably a *Lithospermum*.

PULMONARIA CANADENSIS Yong, Cat. 44 (1783), nom. subnud.—From the Virginias and Carolinas. Probably a synonym of *Mertensia virginiana* (L.) DC.

PULMONARIA ELLIPTICA Raf. New Fl. N. Am. pt. 4, 17 (1836).—"In the Apalachian Mts. of Virginia and Carolina." Probably a synonym of *Hackelia virginiana* (L.) Johnston.

SYMPHYTUM AMERICANUM Yong, Cat. 47 (1783), nom subnud.—From the Virginias and Carolinas. Wholly obscure.

Symphitum fruticosum Sesse & Moc. Pl. N. Hisp. 21 (1887); A. DC. Prodr. x. 121 (1846).—"Habitat in frigidis Chilpanzingi montibus" [Guerrero, Mexico]. = HELIOTROPIUM CALCICOLA Fernald.

SYMPHYTUM HIRSUTUM Raf. Med. Fl. ii. 95 (1830).—"A native American species . . . , found west of the Mississippi, in prairies and glades, and cultivated at Bartram's garden." Probably *S. officinale* L. and not a native.

SYMPHYTUM MINUS Yong, Cat. 47 (1783), nom. subnud.—From the Virginias and Carolinas. Wholly obscure.

2. A TENTATIVE CLASSIFICATION OF THE SOUTH AMERICAN COLDENIAS.

The present paper has evolved from an attempt at definitely allocating certain plants described as Lithospermums by Ruiz & Pavon.

This problem has involved a study of the South American species of *Coldenia*. As these have never been treated comprehensively it is hoped that notes presented in the form of a tentative classification may be useful. Through the kindness of Dr. N. L. Britton and Dr. W. R. Maxon I have had the privilege of studying the South American material of the genus contained in the collections of the New York Botanical Garden and the United States National Herbarium, in addition to that of the Gray Herbarium. Mr. J. F. Macbride of the Field Museum of Natural History has also allowed me to study such material of the genus as he has collected in Peru. The material thus assembled is not so extensive nor so complete as desirable, more than half the collections coming from the Galapagos Islands, and the remainder containing much duplication of collections and localities. It has been consequently necessary to treat a number of species entirely upon the basis of published descriptions. In doing this I have derived much help from Reiche's treatment of the Chilian species, Fl. Chile v. 187–191 (1910), and have usually accepted his verdict on the status of Philippi's rather numerous proposals.

The genus *Coldenia* breaks up into four sections, *Eucoldenia*, *Eddya*, *Sphaerocarya*, and *Tiquiliopsis*. Of these only the last is unrepresented in South America. The sections of the genus may be distinguished as follows:—

Corolla appendaged within.....*Tiquiliopsis*.
Corolla naked within.
  Nutlets attached at the base by a small circular areola, more or less spherical.....*Sphaerocarya*.
  Nutlets attached ventrally, more or less elongated.
    Nutlets rather small, in situ not closely crowded, distinct, anteriorly with a medial ventral keel or groove.....*Eddya*.
    Nutlets rather large, in situ closely juxtaposed, anteriorly plane or definitely angled with the flat faces of the adjacent nutlets closely appressed.....*Eucoldenia*.

The section *Eucoldenia* is readily broken up into three distinct series. First, genuine *Coldenia* consisting of *C. procumbens*, a weedy annual herb of the Old World tropics, which has rugose veiny leaves, and lobed glandular-pubescent tuberculate acuminate fruit. Second, the series *Stegnocarpus* containing *C. canescens* and *C. Greggii* which is composed of suffruticose plants of the adjacent portions of United States and Mexico possessing tomentose unveined leaves, and smooth somewhat villous-strigose merely sulcate non-acuminate fruit. Third, the series *Tiquilia*, consisting of *C. dichotoma* and *C. grandiflora*, slightly shrubby plants of Peru and Chile, which have rugose veiny leaves, and glabrous finely tessellate-granulate mottled merely sulcate

non-acuminate fruit. The genus *Tiquilia* Pers. was based entirely upon *C. dichotoma*. In the past it has been incorrectly used to cover species properly referred to *Eddya* and *Tiquiliopsis*. The nutlets of *C. dichotoma* and *C. grandiflora* are large and have flat closely appressed anterior faces, quite as in the other species of the section *Eucoldenia*, in fact were all four instead of merely two opposite nutlets developed, they would not be hemispherical but quite like those in *C. canescens*.

The species of *Coldenia* on the Galapagos Islands, which was first taken as constituting a new genus and described as *Galapagoa Darwini* by the younger Hooker, is evidently a very close ally of the continental plant called *C. paronychioides*. Obviously of the same group of immediate relatives are the North American *C. hispidissima*, *C. tomentosa*, *C. mexicana*, *C. Purpusii*, and *C. cuspidata*. The seven species mentioned form so homogeneous a group that the synonymy of the genera *Eddya* and *Galapagoa* can be questioned by no one. The section to which I refer the seven species, the oldest name of which is *Coldenia* § *Eddya* Gray, is characterized by its rounded more or less ovoid not closely crowded dark roughened nutlets which are attached ventrally along a well-marked elongated ventral keel or groove.

For the three species, *C. litoralis*, *C. atacamensis*, and *C. parviflora*, I am proposing a new section which may be called, **Sphaerocarya** (TYPE, *C. litoralis* Phil.). These species have practically spherical nutlets which just touch one another and are basally attached by a small circular scar. The petioles in the species are usually without the villous-ciliations characteristic of the section *Eddya*. The species of the section *Sphaerocarya* center in northern Chile.

The final section of *Coldenia* is *Tiquiliopsis*. The group is characterized by its appendaged corollas. The fruit in the three species referred to the section is widely variable and I am not at all satisfied that the division is a natural one. In *C. Nuttallii* the nutlets are elongate-ovoid with a ventral scar quite like that in the species of the section *Eddya*. The nutlets are nearly smooth, however, and the slender petioles are not villous-ciliate. In *C. Palmeri* (= *C. brevicalyx* Wats.!) the nutlets are quite like those in the South American species of the section *Sphaerocarya*, in fact this species seems typical of the section in all but its appendaged corollas. *Coldenia plicata* (= *C. Palmeri* of authors, not Gray) has ovoid nutlets with a very short stipe-like suprabasal attachment unlike that in any other species of the genus. It perhaps finds its nearest relations in the section *Sphaerocarya*.

I have not attempted to place sectionally *C. decumbens* Hauman,

since I know it only from description and am not confident that it is properly included in *Coldenia*. If actually a member of *Coldenia* it may belong to the section *Eddya* or perhaps is worthy of special recognition.

COLDENIA L. Sp. Pl. 125 (1753); Gen. Pl. 61 (1754). *Tiquilia* Pers. Synop. i. 157 (1805). *Monomesia* Raf. Fl. Tellur. iv. 87 (1836). *Galapagoa* Hook. f. Proc. Linn. Soc. i. 277 (1845); Trans. Linn. Soc. xx. 196 (1847). *Stegnocarpus* T. & G. Pacif. R. R. Rep. ii. pt. 2, 169 (1856). *Ptilocalyx* T. & G. l. c. 170. *Eddya* T. & G. l. c. 170. *Lobophyllum* F. Muell. in Hook. Kew Jour. Bot. ix. 21 (1857). *Tiquiliopsis* Heller, Muhlenbergia ii. 239 (1906).

KEY TO SPECIES.

Nutlets plano-convex, 1.5–2.5 mm. long, conspicuously mottled.
  Corolla 3–4 mm. broad; stamens conspicuously exserted. . . . 1. *C. dichotoma.*
  Corolla 9 mm. broad; stamens included. . . . . 2. *C. grandiflora.*
Nutlets spherical to narrowly ovoid, not at all plano-convex, concolorous.
  Nutlets 1–2 mm. long, smooth, ovoid; plant annual; Argentina. . . . . 3. *C. decumbens.*
  Nutlets 0.5–1 mm. long, ovoid or globose, papillose or pebbled; plants perennial, becoming suffruticose towards base; Peru and Chile mainly.
    Nutlets narrowly ovoid with a narrow longitudinal ventral scar; petioles rather short, usually conspicuously villous-ciliate.
      Fruiting calyx ovoid, 1–2 mm. long, obscured by and simulating the foliage, base of lobes closely investing back of nutlets; Galapagos Islands. . . . . 4. *C. Darwini.*
      Fruiting calyx cylindrical, 2.5–3.5 mm. long, evident, lobes not closely investing back of nutlets; mainland. 5. *C. paronychioides.*
    Nutlets spherical or nearly so, with a small circular basal scar; petioles slender, usually not strikingly villous-ciliate.
      Leaf-blades ovate, acute, with 2–3 pairs of veins, about equalling petioles, margins straight; plant regularly dichotomous. . . . . 6. *C. litoralis.*
      Leaf-blades oblong, obtuse, with 4–5 pairs of veins, evidently longer than petioles, margins usually crisped; plant irregularly branched.
        Corolla 8–10 mm. long, twice length of calyx. . . . . 7. *C. atacamensis.*
        Corolla ca. 5 mm. long, about equalling calyx. . . . . 8. *C. parviflora.*

1. COLDENIA DICHOTOMA (R. & P.) Lehm. Asperif. i. 9 (1818). *Lithospermum dichotoma* R. & P. Fl. Peruv. ii. 5, t. 111c (1799). *Tiquilia dichotoma* Pers. Synop. i. 157 (1805). *C. pentandra* Juss. acc. Steud. Nomencl. ed. 1, 212 (1821). *C. Dombeyana* Juss. acc. Buek, Index iii. 108 (1858).—Known only from Peru. The type material came from sandy places towards Lurin, about 25 miles south

of Lima, and near the fort of Pachacamac. I have studied an ill-labeled specimen preserved in the Gray Herbarium, and material gathered by Macbride (no. *5946*) near Lima. From their detailed agreement with the original description and plate, the two collections are evidently typical *C. dichotoma*. These plants mature two single-seeded nutlets the backs of which are strongly convex, finely tessellate-granulate, and more or less ashy and strongly mottled with brown. The anterior face of the nutlet is flat with a small rim, and is orbicular or orbicular-ovate in outline. Four ovules are produced but only two opposite ones mature in each fruit. The peculiar hemispherical nutlets are very characteristic, but may not always be developed since it is likely that the plants, occasionally at least, produce more than two mature nutlets in a fruit. The exserted stamens are sufficient to identify the species in any case. The calyx-lobes are divided to the base.

2. C. GRANDIFLORA Phil. Cat. Pl. Itin. Tarapaca 55 (1891); Reiche, Fl. Chile v. 188 (1910).—I know this species only from descriptions. It appears to have been known to Reiche and Philippi only from the type-collection made at Médanos de Pica in the province of Tarapacá, Chile. It is evidently a close ally of *C. dichotoma*, but is clearly different in its corolla.

3. C. DECUMBENS Hauman, Apuntes Hist. Nat. Buenos Aires i. 55 (1909); Anal. Soc. Cient. Argentina lxxxvi. 301 (1918).—The type of this species came from 2350 m. altitude in the valley of the Rio Tupungal near the confluence of the latter with the Rio Mendoza in northwestern Mendoza, Argentina. I have seen no material of the species. Its nutlets, described as "lisses, brillants, ovoides, à extrémité supérieure assez pointue," are apparently quite different from those of any other South American species of the genus. The species is said to be a slender herbaceous annual, though perhaps it may be perennial as are the other South American species, and has like some of them been described from year-old material. This latter seems improbable, however, since Hauman mentions collections made on widely different dates.

4. C. DARWINI (Hook. f.) Gray, Proc. Am. Acad. v. 341 (1862). *Galapagoa Darwini* Hook. f. Trans. Linn. Soc. xx. 196 (1847); Anderss. Stockholm Acad. Handl. 1853, 86, t. 16, fig. 1 (1854). *G. fusca* Hook. f. l. c. 197; Anderss. l. c. 87, t. 16, fig. 2. *C. fusca* Gray, l. c.—Endemic to the Galapagos Archipelago. I have studied a series of twenty-nine different collections from the Galapagos Islands and am forced to the conclusion that the archipelago has but one variable species of

Coldenia. The island plants vary considerably in compactness, size, and pubescence of leaves, but these differences seem clearly responses to different habitats. *Galapagoa Darwini* and *G. fusca* appear to be merely trivial inconstant pubescence-forms which are not restricted to separate islands, but occur together on most of the latter. I find not the slightest tendency for the reoccurrence of the particular combination of characters present in Hooker's original specimens.

5. C. PARONYCHIOIDES Phil. Cat. Itin. Tarapaca 55 (1891); Reiche, Fl. Chile v. 190 (1910). *Lithospermum aggregatum* R. & P. Fl. Peruv. ii. 4 (1799). *C. aggregata* Rusby, Descr. New Sp. So. Amer. 106 (1920); not based upon *L. aggregatum* R. & P. (?) *C. tenuis* Phil. l. c.; Reiche, l. c.—PERU: Payta, *Safford 9* (US), *Ball* (NY, G), *Williams 2913* (NY, type of *C. aggregata* Rusby); Yonga, *Wilkes Exped.* (US, NY, G). BOLIVIA: La Paz, *Rusby 1430* (NY).—The species appears to range from northern Peru to northern Chile. *Lithospermum aggregatum* R. & P. is the oldest name applied to the species, but it is not taken up since the combination under *Coldenia* would have an homonym in *Coldenia aggregata* Rusby. *Coldenia aggregata* Rusby was based upon material from Payta in northwestern Peru and was named without any reference to the species, founded upon material from near Tarma and Huanuco in west central Peru, which was much earlier described as *Lithospermum aggregatum* by Ruiz & Pavon. *Coldenia aggregata* Rusby, being a synonym, *L. aggregatum* R. & P. might according to the International Rules of Nomenclature be combined under *Coldenia* and the resulting combination be taken as the proper name for the species; however, since this procedure would give the same species synonymous homonyms it is thought that the possibilities of confusion arising from this awkward situation justifies the acceptance of Philippi's specific name. The original Philippian collection came from Pampa del Tamarugal, province of Tarapacá, Chile.

6. C. LITORALIS Phil. Fl. Atacamensis 37 (1860); Reiche, Fl. Chile v. 189 (1910). *C. mitis* Phil. Anal. Univ. Chile xc. 229 (1895). *C. virens* Phil. l. c.—CHILE: deserts of Atacama, *Morong 1257* (US, NY, G); Caldera, *Ball* (NY, G).—Apparently endemic to the province of Atacama, Chile. The type of *C. litoralis* came from the coastal sands at Caldera, Chile. I am following Reiche, l. c., in reducing Philippi's later species.

7. C. ATACAMENSIS Phil. Fl. Atacamensis 37 (1860); Reiche, Fl. Chile v. 189 (1910).—Known to me only from description. Ac-

cording to Reiche, l. c., it occurs in the interior of the province of Antofagasta, Chile.

8. C. PARVIFLORA Phil. Cat. Pl. Itin. Tarapaca 55 (1891); Reiche, Fl. Chile v. 190 (1910). *C. elongata* Rusby, Descr. New Sp. So. Amer. 106 (1920).—Yura, "Peru," *Williams 2562* (NY, type of *C. elongata*). Arequipa, "Bolivia," *Williams 2521* (NY). Southern slopes of Chachani Mountain near Arequipa, *Hinkley 11* (G).—Apparently ranging from southern Peru and adjacent Bolivia, southward to the province of Tarapacá, Chile. The species seems to differ from *C. atacamensis* in its small corollas and more northern range.

EXCLUDED SPECIES.

Coldenia glabra Phil. Anal. Univ. Chile xc. 230 (1895). According to Reiche, Fl. Chile v. 191 (1910), this is a synonym of FRANKINIA GLABRATA Phil.

Coldenia phaenocarpa Phil., Cat. Pl. Itin. Tarapaca 55 (1891). Reiche, l. c., has shown this to be a Heliotropium, H. PHAENOCARPA (Phil.) Reiche.

II. TAXONOMIC RECORDS CONCERNING AMERICAN SPERMATOPHYTES.

1. PARKINSONIA AND CERCIDIUM.

Both *Cercidium* and *Parkinsonia* appear to be valid genera, but their acceptance can be justified only after a slight change in their traditional limits and the stressing of characters not heretofore emphasized by those who have maintained the genera. All authors have sanctioned the recognition of *Parkinsonia*, and most recent students have insisted on the validity of *Cercidium*. The writers on the flora of Argentina, disregarding the obviously albuminous seeds produced by their "Brea," have persisted in treating their species of *Cercidium* as a *Caesalpinia*, but there are good morphological characters and overwhelming usage arguing against this treatment. Karsten, Fl. Colomb. ii. 25, t. 113 (1862), proposed a segregate genus *Rhetinophloem*, but later, Engler's Jahrb. viii. 346 (1887), reduced it to a subgenus of *Cercidium*. In 1876, Watson, Proc. Am. Acad. xi. 135 (1876), concluded that the characters used to separate *Cercidium* and *Parkinsonia* failed when applied to the North American species and proceeded to merge the two genera. Watson's opinion prevailed until 1889 when Sargent, Gard. & Forest ii. 388 (1889), reopened the

matter and reestablished *Cercidium*. This decision was based on his finding that "the valvate imbrication of the calyx-lobes is constant in *Cercidium* and that the thickened glandular claw of its petals does not appear in our species of *Parkinsonia*," and further and more important that "the fruit which in *Parkinsonia* is linear, rounded and torose," is in *Cercidium* "linear-oblong compressed, and in one of our species slightly contracted between the seeds." Since 1889 the acceptance of *Cercidium* has been almost universal.

A study of the material in the Gray Herb. (G), and some very interesting collections from the United States National Herbarium (US) which were loaned me through the interest of Dr. J. N. Rose, has shown that the sepals are not always simply valvate in *Cercidium*, but rather that there seems to be intraspecific variation between valvate and induplicate-valvate conditions. In fact these variations were used by Karsten as characters of his subgenera, *Eucercidium* and *Rhetinophloem*. I am unable to see even specific differences in this character since both conditions frequently occur on the same specimen. In *Parkinsonia*, as currently taken, the calyx-lobes are not always imbricate, since *P. microphylla* has valvate calyx-lobes quite indistinguishable from those in indubitable Cercidiums. It is only in *Parkinsonia aculeata* (the type species of *Parkinsonia*) and *P. africana* that very definitely imbricate aestivation occurs, and then in such an extreme form as not to be even approached by the conditions in the species of *Cercidium* or the other species of *Parkinsonia*. A study of the claw of the petal has revealed no difference between the two genera.

The characters of generic import currently ascribed to the fruit of *Cercidium* and *Parkinsonia* fail miserably when they are applied to all the known species of the genera. *Parkinsonia aculeata* and *P. africana* are very closely related and are obviously congeneric, but the latter has the legumes somewhat compressed with thickened almost straight margins, so that they appear quite different from the terete torose pods of *P. aculeata*. The fruits of *P. africana* and *C. texanum* are very similar as to margin, width, and thickness, in fact the only conspicuous difference is in the length. Practically every species of *Cercidium* frequently has the margin of its legumes more or less sinuate or even contracted between the seeds.

Sargent, Man. Trees N. Am. 585 (1922), finds generic difference in the relations of the spine to the leaves, giving the leaf-rachis as spinescent in *Parkinsonia* and not so in *Cercidium*. In fact the leaf-rachis is spinescent only in *P. aculeata* and *P. africana*. In the plant called

P. microphylla there are no spines, whereas in its near relative, *Cercidium sonorae*, the spines are clearly below the leaf-rachises and exactly as in other indubitable Cercidiums.

Past authors have accepted *Parkinsonia microphylla* Torr., as a member of *Parkinsonia*, being largely influenced in so doing, no doubt, by the extreme similarity in its fruit with that of *P. aculeata*. However, *P. microphylla* differs from *P. aculeata* and *P. africana* in having short corymbose rather than very elongate racemes, short filiform terete rather than extremely long phyllodial leaf-rachises, and calyx-lobes that are valvate or a trifle induplicate-valvate rather than extremely imbricate in the bud. It is significant that these characters are possessed by all the species of *Cercidium*, and that *P. microphylla* in habit resembles the species of *Cercidium* much more than it does the two species of genuine *Parkinsonia*. In brief, *Parkinsonia microphylla* is clearly a species of *Cercidium* and is consequently transferred to that genus. *Parkinsonia* thereby reduced to homogeneity consists only of *P. aculeata* and *P. africana*. *Parkinsonia* and *Cercidium*, then, become two well marked and very natural genera eminently worthy of recognition, as may be appreciated by a study of the following key:—

Inflorescence an elongate raceme, 8–18 cm. long; rachis of pinnae phyllodial, 1–6 dm. long, apparently borne on the spines; calyx-lobes very strongly imbricate in the bud.....*Parkinsonia.*

Inflorescence a short corymb, 1–3 cm. long; rachis of pinnae 1–4 cm. long, terete, never phyllodial, clearly borne below the spines; calyx-lobes valvate or induplicate-valvate in bud.....*Cercidium.*

Parkinsonia [Plum.] L. Sp. Pl. 375 (1753); Gen. Pl. 177 (1754).

Key to Species.

Rachis of pinnae winged, 1.5–3 mm. wide, 15–60 cm. long; pinnae ca. 25-jugate; legumes torose, terete, margin very strongly undulate but scarcely thickened.....1. *P. aculeata.*

Rachis of pinnae not winged, 1 mm. wide, 5–15 cm. long; pinnae 15-jugate or less so; legumes somewhat compressed, scarcely torose, margins slightly undulate and evidently thickened. 2. *P. africana.*

1. Parkinsonia aculeata L. Sp. Pl. 375 (1753). *P. spinosa* HBK. Nov. Gen. et Sp. vi. 335 (1823). *P. Thornberi* Jones, Contr. W. Bot. xii. 12 (1908).—Native of America, but widely cultivated over the warmer parts of the world. For notes regarding its distribution see the account by Sargent, Silva N. Am. iii. 87, t. 81 (1892). The name "*Parkinsonia spinosa* HBK" is evidently a *lapsus* meant for *P. aculeata* L. The specimen cited by Kunth is apparently not

P. aculeata, however, but is the collection which finally became the type of *Cercidium spinosum* Tul.

2. P. AFRICANA Sond. Linnaea xxiii. 38 (1850); Engler, Veg. der Erde ix. Band 3, Heft 1, 501, fig. 267 (1915).—Known only from South Africa.—AFRICA: on a stony plain, Damaraland, *Marloth 1216;* without locality, *Zeyher 557*.

CERCIDIUM Tul. Arch. Mus. Paris iv. 133 (1844). *Rhetinophloeum* Karsten, Fl. Colomb. ii. 25, t. 113 (1862)

KEY TO SPECIES.

Pinnae 1–3-jugate.
- Ovary densely sericeous-strigose; pinnae 1- or occasionally 2-jugate.....1. *C. texanum.*
- Ovary glabrate; pinnae commonly 3-jugate.
  - Pod very flat, 2–3 mm. thick, 8–11 mm. wide; leaves green; branches dull green.....2. *C. macrum.*
  - Pod thickened, 5 mm. thick, 10–15 mm. wide; leaves pale; branches pallid.
    - Twigs glabrate, very pale.....3. *C. floridum.*
    - Twigs densely short-pubescent, cinerascent.....4. *C. peninsulare.*

Pinnae 4–15-jugate.
- Leaves appearing simply pinnate, primary rachises undeveloped; pinnules minute, ca. 1–1.5 mm. broad, 1–2.5 mm. long.
  - Plant unarmed; leaflets orbicular or ovate; fruit torose, terete; North American.....5. *C. microphyllum.*
  - Plant with long spines; leaflets narrowly oblong; fruit very flat, margin straight; South American.....7. *C. andicola.*

Leaves or most of them evidently bipinnate, primary rachises developed; pinnules larger, 1–2.5 mm. broad, 2–7 mm. long.
- Leaves conspicuously pubescent, cinereous.....8. *C. praecox.*
- Leaves glabrate or glabrous, glaucous or yellow-green.
  - Legumes 4–7 cm. long, 4 mm. thick, margin strongly undulate; Sonora.....6. *C. sonorae.*
  - Legumes 3–5 cm. long, 1–2 mm. thick, margin not at all undulate; Argentina.....9. C. *australe.*

1. CERCIDIUM TEXANUM Gray, Pl. Wright. i. 58 (1852). *Parkinsonia texana* Wats. Proc. Am. Acad. xi. 136 (1876).—Southwestern Texas. TEXAS: Uralde, 90 mi. northwest of San Antonio, 1879, *Palmer 270;* Eagle Pass, 1879, *Palmer 271;* Rio Grande, 1848, *Wright;* without locality, *Pope;* western Texas, 1849, *Wright 149;* without locality, 1852 [*Wright*]; "New Mexico," 1851, *Wright 115*.

2. **C. macrum**, sp. nov., arboreum; ramulis glabratis opacis viridibus; spinis 0.7 mm. longis; foliis opacis sparse inconspicueque strigosis unijugis, rachibus primariis 4–8 mm. longis; pinnis trijugis, rachillis 7–15 mm. longis; pinnulis oblongis vel oblongo-obovatis emarginatis vel rotundatis sessilibus 4–6 mm. longis 2–3.5 mm. latis, basi acutis

saepe paullo obliquis, costis conspicuis; floribus in racemas pauciflores axillares subcorymbosas congestis; ovario glabro; leguminibus valde compressis 2–3 mm. crassis 8–11 mm. latis 3–6 cm. longis, margine rectis vel paullo undulatis; seminibus brunneis oblongis ca. 7 mm. longis 4 mm. latis.—*C. floridum* of authors. *C. floridum* of Sargent, Silva N. Am. iii. 83–4, t. 129 (1892), as to plant described and pictured. *Hoopesia arborea* Buckley, Proc. Acad. Philad. 1861, 453 (1861), in part; 1870, 137 (1870); Gray, Proc. Acad. Philad. 1862, 163 (1862).—TEXAS: Rio Hondo, Cameron Co., *Chandler 7034;* Fordyce; 1905, *Tracy 9065;* hills, La Salle Co., 1881, *Buckley*. TAMAULIPAS: San Fernando to Jimeney, 1902, *Nelson 6608;* vicinity of Victoria, 1907, *Palmer 125*. NUEVO LEON: mesas near Monterey, 1889, *Pringle 2537* (TYPE, Gray Herb.); near Pesquerea Grande, northwest of Monterey, 1847, *Gregg;* without locality, *Gregg;* Nuevo Leon, *Berlandier 3142* (*707*).—This species is the well known one of Texas and northeastern Mexico current as *Cercidium floridum* Benth. That species, however, is based upon a flowering specimen made by Coulter who did not collect within the range of *C. macrum*. Coulter did, on the other hand, collect within the range of the common "Palo Verde" of Arizona. It therefore seems evident that Bentham's name cannot properly be applied to the plant here called *C. macrum*, since it was impossible for Coulter to have collected it, and since it seems more than probable that Bentham's name should be applied to the closely related species of Arizona which Coulter could scarcely have missed collecting. The Gregg and Wislizenus collections cited under Gray's original description of "*Cercidium floridum* Benth." represent *C. macrum*, those of Emory and Fremont are true *C. floridum*. From their source, Corpus Christi, it seems probable that the fragments of *Cercidium* in the complex type of *Hoopesia arborea* belong to *C. macrum* rather than to *C. texanum*. *Hoopesia arborea* was based, according to Gray, Proc. Philad. 1862, 163 (1862), upon material representing three distinct leguminous genera (*Cercidium*, *Acacia*, and *Pithecollobium*). No particular one of the three elements predominates in Buckley's description nor in his material. I am not definitely associating *Hoopesia arborea* with any species, but am dropping it from consideration as a *nomen confusum*.

3. C. FLORIDUM Benth. in Gray, Pl. Wright. i. 58 (1852). *Parkinsonia florida* Wats. Proc. Am. Acad. xi. 135 (1876). *P. Torreyana* Wats. l. c. *C. Torreyanum* Sarg. Gard. & Forest ii. 388 (1889); Silva N. Am. iii. 85, t. 80 (1892).—Southern Arizona to the Colorado Desert of California, southward into adjacent Sonora and Lower

California.—ARIZONA: near Fort Yuma, 1880, *Lemmon 39, 40;* rocky hills at Camp Grant, 1867, *Palmer 62;* Gila [River], *Sutton Hayes 209;* valley of the Gila, *Emory;* Gila [River], 1852, *Thurber;* near the Colorado [River], *Bigelow;* without locality, 1867, *Palmer.* CALIFORNIA: Palm Springs, alt. 150–200 m., *Parish 4115;* in desert sand, Palm Spring, alt. 120 m., *Spencer 755;* Palm Springs, *Eastwood 3004.* —For the present use of the name "*Cercidium floridum* Benth." see discussion under *C. macrum.*

4. C. PENINSULARE Rose, Contr. U. S. Nat. Herb. viii. 301 (1905); Goldman, Contr. U. S. Nat. Herb. xvi. 336, t. 114 (1916).—Southern Lower California.—LOWER CALIFORNIA: La Paz, 1890, *Palmer 112;* San José del Cabo, 1897, *Anthony 363.*—This differs from *C. floridum* in scarcely more than pubescence. In range, however, it is widely separated from that latter species.

5. **C. microphyllum** (Torr.) Rose & Johnston, comb. nov. *Parkinsonia microphylla* Torr. Bot. Mex. Bound. 59 (1859); Pacif. R. R. Rep. iv. 82 (1857); Sargent, Silva iii. 91, t. 132 (1892).—Southern Arizona, Sonora, and middle and northern Lower California.—ARIZONA: poor rocky hills, Camp Grant, 1867, *Palmer 63;* Gila [River], *Sutton Hayes 217;* Williams River, *Bigelow;* desert near Fort Yuma, 1880, *Lemmon 41;* Maricopa, 1881, *Parry;* Lowell, 1884, *W. F. Parish 49;* without locality, 1871, *Lieut. Wheeler.*

6. **C. sonorae** Rose & Johnston, sp. nov., arboreum; ramulis breviter strigosis canescentibus; spinis 0–9 mm. longis; foliis sparse pubescentibus 1–2-jugis, rachibus primariis 0–5 mm. longis apice subulato caduco 1–2 mm. longo; pinnis 2–4-jugis 12–32 mm. longis; pinnulis subsessilibus 1.5–2 mm. latis 2–3 mm. longis oblongis basi oblique rotundatis, apice obtusis mucronatis costa conspicua; inflorescentiis axillaribus corymboso-racemosis paucifloris; dense breviterque pubescentibus; leguminibus 4–7 cm. longis 4 mm. crassis 7–8 mm. latis margine valde undulatis; seminibus oblongis 1 cm. longis 4 mm. latis. —SONORA: Guadeloupe, Feb., *Parry 321a* (G); Torres, 1903, *Coville 1664* (US); Guaymas, 1922, *Orcutt 1196* (US); dry hills in the vicinity of Guaymas, 1910, *Rose, Standley & Russell 12586* (TYPE, U. S. Nat. Herb.).—A very well marked species apparently nearest to *C. microphyllum,* but differing in its thorny stems, larger, petioled and frequently several-jugate leaves, more compressed less torose legumes, and much smaller seeds. The species is known only from Sonora.

7. C. ANDICOLA Griseb. Abh. Ges. Wiss. Goett. xxiv. 114 (1879). *Caesalpinia praecox,* var. *andicola* Hoss. Bol. Acad. Córdoba xxvi.

145 (1921).—Northern Argentina and southern Bolivia.—BOLIVIA: Toldos near Bermejo, 1800 m. alt., 1903, *Fiebrig 2193* (G).

8. C. PRAECOX (R. & P.) Harms in Engler Jahrb. xlii. 91 (1908). *Sappania praecox* R. & P. Fl. Peruv. t. 376, ined. *Caesalpinia praecox* H. & A. Bot. Misc. iii. 208 (1833), as to description and accepted name. *Cercidium spinosum* Tul. Arch. Mus. Hist. Nat. Paris iv. 134 (1845). *Rhetinophloem viride* Karsten, Fl. Colomb. ii. 25, t. 113 (1862). *Cercidium viride* Karsten in Engler, Jahrb. viii. 346 (1887). *Cercidium plurifoliolatum* Micheli, Mém. Soc. Phys. et Hist. Nat. Genève xxxiv. 269, t. 18 (1903). *Cercidium Goldmani* Rose, Contr. U. S. Nat. Herb. viii. 301 (1905). *Cercidium unijugum* Rose, l. c.—Extreme middle-western Peru to northern Venezuela, the Leeward Islands (Curaçao *fide* Urban, Margarita), Santo Domingo (*fide* Urban), and southern and western Mexico.—ECUADOR: between Loja and Portovelo, *Rose, Pachano & Rose 23330* (US). VENEZUELA: El Valle, Margarita Island, alt. 200 m., 1903, *J. R. Johnston 31* (G). La Vela de Coro, 1917, *Curran & Haman 423, 468, 499* (G); Cumana, 1917, *Curran & Haman 1251* (G). MEXICO: Santa Lucia, Oaxaca, 1908, *Purpus 3187* (G); hills, Dominguillo, Oaxaca, alt. 900 m., 1895, *L. C. Smith 437* (G); between Teotitlan and San Antonio, Oaxaca, alt. 900 m., 1907, *Conzatti 2119* (G); San Luis, Guerrero, alt. 100 m., 1899, *Langlassé 933* (G); Orizaba, Vera Cruz, *Botteri 994* (G); Maria Madre Island, Tepic, 1897, *Maltby 62* (US); vicinity of Fuerte, Sinaloa, 1910, *Rose, Standley & Russell 13516* (US); San José del Cabo, Lower Calif., 1911, *Rose 14466* (US); Guaymas, Sonora, 1897, *Maltby 186* (US); dry cactus plain near Navojoa, Sonora, 1910, *Rose, Standley & Russell 13176* (US); La Tinajo, Sonora, 1890, *Hartman 241* (G).—I have searched in vain for characters of sufficient constancy to justify the treating of the Mexican material as representing a valid species. It can be generally said that the South American material has smaller flowers and darker branches than the Mexican, but these characters are erratic and can scarcely be used for specific distinction. The type of Ruiz & Pavon's species came from middle western Peru and is distinct from the plant of the Argentine which authors, following Hooker & Arnott, have confused with it. A discussion of this subject will be found under the next species.

9. **C. australe**, sp. nov., arboreum vel arbusculum 1–8 m. altum spinosum; ramulis glabratis vel sparsissime strigoso-pilosis striatis pallide viridibus; spinis 8–15 mm. longis rectis; foliis bipinnatis 1–2-jugis glabratis vel sparsissime adpresseque pilosis flavo-viridibus, rachibus primariis 5–10 mm. longis; pinnis 5–7-jugis rachibus 1–2

cm. longis; pinnulis oblongis 1–2 mm. latis 2–5 mm. longis obtusis basi subobliquis; petiolulis ca. 0.2 mm. longis; floribus breviter corymboso-racemosis; petalis luteis immaculatis maxime ca. 1 cm. longis; leguminibus membranaceis valde compressis acutis reticulatim venosis glabratis 3–5 cm. longis 8–10 mm. latis 1–1.5 mm. crassis margine rectis.—*Caesalpinia praecox* of H. & A., Bot. Miscl. iii. 208 (1833); as to plant of Gillies, not as to R. & P. name or plate. *Cercidium praecox* of Manganara, Anal. Soc. Cient. Argent. lxxxvii. 163 (1919), and other recent authors. *Cercidium andicola*, var. *petiolata* Chod. & Hass. Bull. Herb. Boiss. n. s. iv. 828 (1904).—Central Argentina and adjacent Paraguay.—ARGENTINA: Andalgalá, Prov. Catamarca, *Jörgensen 1119* (G); vicinity of General Roca, Rio Negro, alt. 250–360 m., 1915, *W. Fischer 20* (TYPE, Gray Herb.); San Juan, Mendoza, *Jameson* (G).—Although this tree of the Argentine has long borne the name *Caesalpinia praecox* or *Cercidium praecox*, it seems clear that it has been improperly so called. *Caesalpinia praecox* was published by Hooker & Arnott in 1833 after they had concluded that a plant collected by Gillies in Mendoza was specifically identical with Ruiz & Pavon's manuscript species, *Sappania praecox*, and its unpublished plate. Gillies's specimen represents the Argentine plant that has passed as *C. praecox* and which is here named, *C. australe*. Since Ruiz & Pavon did not collect in Argentina or at all close to the range of *C. australe*, and described in their flora only material collected by themselves or Dombey in either Chile or Peru, it must be clear that *Sappania praecox* R. & P. cannot be the plant that Hooker & Arnott thought it to be. Since there is a *Cercidium* which occurs in middle-western Peru where Ruiz & Pavon did much collecting, it certainly seems much more natural to assume this to be the *Cercidium* collected and illustrated by them. This plant I doubtfully associate with the Venezuelan species, current as *Cercidium spinosum* Tul. Hooker & Arnott's description of "Caesalpinia (Sappania) *praecox* (R. et Pav. *Fl. Peruv. t. 376. ined.*)" is perfectly ambiguous, applying equally well to the Argentinian and to the more northern plant. Since Ruiz & Pavon's name was taken up and their plate cited, and since their plant is not at all excluded by the original description but agrees with the diagnosis as well as does the Argentinian plant, I am confining their name to the plant for which it was originally intended, and am consequently giving a new name to the "Brea" of the Argentine. The plant from Mendoza differs from the common form of *C. australe* in having its ovary velvety-pubescent. It may be worthy of nomenclatorial recognition.

2. New or otherwise noteworthy Plants.

Persea Hartmanii, sp. nov., glabrata arborea 6–9 m. alta; ramis juventate fulvo-tomentosis; foliis anguste ellipticis vel lanceolatis glabratis 6–11 cm. longis 15–36 mm. latis basi cuneatis apice saepe acutis subtus pallidioribus; petiolis 1–2 cm. longis vetustis glabratis canaliculatis; inflorescentiis paucifloris laxe paniculatis 7–10 cm. longis glaberrimis folia paullo superantibus; pedunculis gracilibus 4–7 cm. longis; pedicellis 4–6 mm. longis; floribus ca. 4 mm. longis; calycis lobis ovatis acutis ca. 2.5 mm. longis subaequalibus extus glaberrimis intus paullo strigosis medium versus articulatis superiori parte decidua; staminibus exterioribus introrsis 2 mm. longis, antheris oblongo-linearibus ca. 0.9 mm. longis 4-locularibus, loculis inferioribus latis longioribus superiores lateraliter oblique tangentibus, filamentis sparse villosis angustis; staminibus introrsis exteriores simulantibus sed basem versus biglanduliferis, glandulis ovatis sessilibus; staminodiis ca. 9 mm. longis, capitulis acute sagittatis quam stipes duplo longioribus, stipitibus villosis crassis capitula latitudine aequantibus; ovariis glabris globosis.—Mexico: Batopilas, Chihuahua, April 1892, *C. V. Hartman 1029* (type, Gray Herb.).—Although in gross habit suggesting a species of *Phoebe*, in technical characters this seems clearly a *Persea*. It is well marked in the latter genus appearing to be without immediate relatives. The outstanding features of the plant are its glabrous ovary and flowers, and peculiar calyx-lobes. These latter have a transverse medial line of abscission.

Persea podadenia Blake, var. **glabriramea**, var. nov.; caulibus et pedunculis glaberrimis castaneis.—Mexico: Orizaba, *Botteri 81* (type, Gray Herb.), *1166*.—The type of *P. podadenia* comes from Durango and is very densely strigose.

Phoebe longipes, sp. nov., glaberrima; foliis lanceolatis 12–22 cm. longis 4–5.5 cm. latis longe falcato-acuminatis subtriplinerviis supra laevibus subtus paullo pallidioribus delicate reticulatis basi rotundatis vel rare cuneatis; petiolis 25 mm. longis; ramulis laevibus glaucescentibus fuscis; inflorescentiis laxissime paniculatis ca. 1 dm. longis quam foliae valde brevioribus paucifloris; pedunculis gracilibus ca. 6.5 cm. longis ascendentibus; pedicellis gracilibus 15–25 mm. longis; bracteolis deciduis; floribus ca. 4 mm. longis; calycis segmentis ovatis acutis 2.5 mm. longis subaequalibus extus glaberrimis intus paullo strigosis; staminibus exterioribus 1.8–2 mm. longis introrsis, antheris oblongis ca. 1 mm. longis, loculis 4 valde 2-seriatis; staminibus interioribus exterioribus similibus sed extrorsis et cum filamentis saepe villosis basin versus abrupte dilatatis et cum glandulis disciformibus

munitis; staminodiis ca. 1.6 mm. longis, capitulis ca. 4 mm. longis deltoideo-ovatis stipite compresso strigoso duplo longioribus; ovariis glabratis globoso-ovoideis; stylo glabro quam ovarium ½ longiori.—MEXICO: without precise locality, *Pringle 8829* (TYPE, Gray Herb.).—Apparently most closely allied to *P. salicifolia* Nees, but differing in having longer petioles and pedicels, as well as larger leaves and flowers. The type was probably collected in south-central Mexico.

Misanteca costaricensis, sp. nov., paniculata arborea 7–10 m. alta; ramis glabris; foliis elliptico- vel obovato-oblongis glabris concoloribus 10–14 cm. longis 3–5 cm. latis, subtus sparse delicateque reticulatis; supra inconspicue reticulatis, basi cuneatis, apice breviter acuminatis, petiolis ca. 15 mm. longis quadrangularibus; inflorescentiis paniculatis 5–10 cm. longis dense brunnescenterque villoso-velutinis; floribus ad apices pedunculorum laxe pyramidaliterque congestis; pedicellis 1–2 mm. longis sparse villosis; calyce ca. 1.5 mm. longo infundibuliformi vel subobconico brunneo extus glabrato, lobis 6 late ovatis obtusis intus sparse pubescentibus, exterioribus ca. 0.8 mm. longis, interioribus ca. 0.6 mm. longis; staminibus 3 connatis ca. 1 mm. longis conspicuis; antheris glabratis crasse bilocularibus; filamentis latis dense villosis; glandulis 3 distinctis semiorbicularibus vel ellipticis basi ad androphorum adfixis; staminodiis absentibus; ovario glabro ovato quam stylus ½ breviori.—COSTA RICA: Santiago Hills near San Ramon, 1100 m. alt., June 1, 1901, *A. M. Brenes 14403* (TYPE, Gray Herb.).—Related to the West Indian *M. triandra* (Sw.) Mez, but differing in its villose-velutinous inflorescence, distinct entire glands on the androphore, and larger more elongate less gradually acuminate leaves. It is readily separated from the remaining species of the genus, all close allies of *M. capitata* C. & S., by its velutinous loose paniculate inflorescence and smaller less prominently reticulate leaves.

Misanteca Peckii, sp. nov., arbor parva cum floribus racemosis; ramis brunnescenter et dense hirsuto-villosis; foliis oblanceolatis vel obovato-oblongis basi cuneatis apice abrupte longeque acuminatis margine paullo revolutis supra nitidis glabris conspicue impresseque nervatis subtus setosis opacis pallidis valde conspicueque nervatis petiolis 9–12 mm. longis, inflorescentiis racemosis 2–3 cm. longis; paucifloris brunnescenti-velutinis; floribus atro-coeruleis valde depressis 1.8–2.2 mm. diametro 1.5 mm. altis subcarnosis; pedicellis 0.2–1 mm. longis lobis 6 valde 2-seriatis, exterioribus latissime triangularibus ca. 1.5 mm. latis 0.6 mm. altis, interioribus deltoideis obscuris ca. 0.3 mm. altis; staminibus 3 in androphorum latum pyra-

midale connatis; antheris 2-locellatis late obovatis glabratis, locellis supra medium impositis; filamentis nullis (?); staminoidiis nullis; glandulis confluentibus ad basem androphori in annulum undulatum confluentibus; ovario globoso glabrato; bacca ellipsoidea ca. 2.2 cm. longa 11 mm. diametro coccinea; cupulo cyathiformi conspicue duplomarginato, basi incrassato.—BRITISH HONDURAS: locality not given, 1905–7, *M. E. Peck 826* (TYPE, Gray Herb.). —A very distinct species and perhaps representing an undescribed genus since it differs from the other members of *Misanteca* in its few-flowered racemose inflorescence, depressed broad rather pulpy flowers, strongly bicolored leaves, and stamens which appear to lack filaments and are connate to form a very broad pyramidal rather than columnar androphore. The type was probably collected in middle eastern British Honduras.

Calliandra socorrensis, sp. nov., fruticosa glabra; caulibus rigidis laxe multiramosis; foliis glaberrimis numerosis; pinnis bijugis 15–30 mm. longis; foliolis 5–7-jugis congestis 4–12 mm. longis 2–4.5 mm. latis firmis oblongis apice obtusis basi valde obliquis; stipulis persistentibus oblongo-lanceolatis ca. 2–3 mm. longis acutis; pedicellis 1–2 mm. longis; pedunculis axillaribus 2–3 cm. longis ascendentibus; floribus ignotis; leguminibus glabris ca. 5-spermis, valvis membranaceo-coriaceis reticulatis incrassato-marginatis 5–6 cm. longis 8–9 mm. latis.—MEXICO: Socorro Island, 1897, *A. W. Anthony* (TYPE, Univ. Calif. Herb. no. 83534).—Most nearly allied to *C. formosa* (Kunth) Benth., a species ranging widely over northern and western Mexico, from which it differs in its much branched compact wood habit, and much smaller crowded leaflets.

Piscidia acuminata (Blake), comb. nov. *Ichthyomethia acuminata* Blake, Jour. Wash. Acad. ix. 249 (1919).

Piscidia communis (Blake), comb. nov. *Ichthyomethia communis* Blake, Jour. Wash. Acad. ix. 247 (1919).

Piscidia grandifolia (Donn. Sm.), comb. nov. *Derris grandifolia* Donn. Sm. Bot. Gaz. lvi. 55 (1913).

Fagonia cretica, var. **canariensis**, var. nov., prostrata ramosa *F. creticae*, var. *typicam* simulans sed differt floribus et fructibus perspicue minoribus; fructibus 5–6 mm. crassis: petalis 6–7 mm. longis.—CANARY ISLANDS: roadside near Guia, Gran Canaria, Dec. 1893, *Cook 77;* arid open lower parts of Teneriffe, Jan. 1845, *Bourgeau 46;* littoral belt near Santa Cruz, Teneriffe, April 1888, *J. Ball* (TYPE, Gray Herb.).—This plant of the Canary Islands has passed as *F. cretica* L., but that is a plant of the Mediterranean basin which has fruit 6–7.5 mm. thick and petals 7–10 mm. long. The variety

canariensis, because of its smaller fruit and flowers, is very suggestive of the common American forms of the genus, and it was perhaps this fact that gave Engler, Veg. der Erde ix. Band 3, Heft 1, 731 (1915), his reasons for treating the plants of America as *F. cretica* var. *chilensis* (H. & A.) Engler, var. *californica* (Benth.) Engler, and var. *asper* (Gay) Engler. However, Standley, Proc. Biol. Soc. Wash. xxiv. 244 (1911), has pointed out that the American plants are distinguishable from true *F. cretica* by the possession of a fruit which is noticeably smaller in size, and which has a shorter, scarcely thickened beak. As the American plants are widely separated geographically from their closest ally, *F. cretica*, of the Old World, and since the collections from the two regions are distinguishable by their fruit, it seems best to consider them specifically distinct, and to take up *F. chilensis* H. & A. as the comprehensive name for the American relatives of *F. cretica*.

Some writers, such as Anderson, Jour. Linn. Soc. v. suppl. 11 (1860), and the editors of the Index Kewensis, have referred practically all the described forms of *Fagonia* to *F. cretica*. This treatment, however, is extreme, for there appears to be a goodly number of species in northern Africa and southwestern Asia which are well defined entities with characteristic habit and natural ranges. Most of the species have several synonyms, and in a number of cases the current name is not always the oldest. For example, *F. indica* Burm. f., founded on a good description and plate, has been disregarded for such comparatively recent synonyms as *F. persica* DC., *F. mysorensis* Roth, *F. microphylla* Boiss., *F. myriacantha* Boiss., and *F. parviflora* Boiss.

Protium panamense (Rose), comb. nov *Icica panamensis* Rose, N. Am. Fl. xxv. 260 (1911).

Euphorbia (§**Tithymalus**) **Hinkleyorum**, sp. nov.. perennis e radice erecta crassa oriens 1–2 dm. alta glaberrima; caulibus compluribus erectis herbaceis medium versus laxe dichotomeque ramosis; foliis caulinis inferioribus alternatis sparsis, caulinis superioribus et rameis oppositis valde conspicuis, omnibus glabris concoloribus late adfixis 8–24 mm. longis et latis palminerviis distinctis lacerato-dentatis orbicularibus vel obovatis vel subflabelliformibus basi truncatis vel cuneatis edentatis symmetricis; stipulis nullis; involucris solitariis axillaribus glabris cyathiformibus ca. 2 mm. longis ca. 1 mm. longe pedunculatis, fauce cum lobis subulatis vel anguste deltoideis hirsutis ca. 0.5 mm. longis munita; glandulis 5 ca. 1.3 mm. longis et latis, subtus pallidis rariter hirsutis, supra laminato-rugosis brunneis,

margine retusis vel truncatis undulatis; stylis ca. 1.5 mm. longis, lobis bipartitis glabris; stigmatibus paullo incrassatis; capsula glabra ca. 2 mm. longa ca. 4 mm. pedunculata; seminibus oblongis obscure quadrangularibus ca. 2 mm. longis ca. 1.3 mm. crassis ecarunculatis griseis delicate impresse atromaculatis.—PERU: sandy pampa on the southern slopes of Chachani Mountain near Arequipa, alt. 3300 m., March 1920, *Mr. & Mrs. F. E. Hinkley 7* (TYPE, Gray Herb.).—This species evidently belongs to Boissier's subsection *Ipecacuanhae*, and probably has its nearest relative in the variable but very different *E. portulacoides* Spreng., from which it differs in its larger dark-colored coarsely toothed apparently connate (though really distinct) broader leaves, and much more loosely branched habit. In foliage *E. Hinkleyorum* suggests the Galapagean, *E. amplexicaulis* Hook. f., in the shape and attachment of its upper leaves. It is, however, not at all closely related to that species. According to its discoverers the plant is known as "esquera" and is used in the treatment of fevers.

Malvastrum Hinkleyorum, sp. nov., annuum simplex erectum 1.5–4.5 dm. altum glabratum vel apicem versus sparse villosum et setosum; caulibus stramineis gracilibus; foliis palmate 3-foliolatis 3–4.5 cm. longis; foliolis acutis oblanceolatis lacerato-dentatis vel lobatis glaberrimis subtus pallidis, dentibus cum seta terminatis; petiolis 1–2.5 mm. longis gracilibus canaliculatis supra minute viscidulo-villosis; stipulis conspicuis oblique acuminateque lanceolatis vel oblongo-lanceolatis 8–13 mm. longis 2–4 mm. latis longe sparseque ciliatis; pedunculis gracilibus 2–6 cm. longis 2–4-floris unilateraliter congesti-floris, ab axillis superioribus orientibus; calycibus ca. 4 mm. longis conspicue ciliatis sparse setosis, fructiferis ca. 4.5 mm. latis, lobis ovatis acutis ca. 2.5 mm. longis; pedicellis 0.5–1 mm. longis; bracteolis 3 lineari-filiformibus 3–4 mm. longis; corollis ochroleucis (in sicco rosaceis) ca. 3.5 mm. longis; tubo staminali 2–2.5 mm. longo; stylo ca. 1.2 mm. longo, lobis 10–13 glabris non dilatatis; stigmatibus capitellatis lobo styli vix crassioribus minute pubescentibus; carpellis glabratis valde rugosis 1–1.5 mm. longis.—PERU: hillsides on the southern slope of Chachani Mountain near Arequipa, 2100 m. alt., March 1920, *Mr. & Mrs. F. E. Hinkley 43* (TYPE, Gray Herb.).—A very distinct annual species, well marked by its glabrous herbage, three-parted lacerate-dentate leaves, and conspicuous stipules. In Baker's synopsis, Jour. Bot. xxix. 168 (1891), it falls with *M. perurianum* (L.) Gray, a species from which it is clearly distinct. It is a pleasure to be able to name this and the previous species in honor of Mr. and Mrs. F. E. Hinkley, who in 1920, during their hours of recreation while connected

with the Arequipa Station of the Harvard College Observatory, made on the southern and lower slopes of the volcano of Chachani (about 10 km. north of Arequipa) a small but highly interesting plant-collection which has materially enriched the Gray Herbarium with well prepared material of many new or rare species.

Malvastrum arequipense, sp. nov., annuum herbaceum simplex erectum 5–20 cm. altum stellato-setosum gracile; foliis paucis oblongo-ovatis 3-lobatis sinuato-dentatis 1–3 cm. longis 8–15 mm. latis stellato-setosis basi obtusis; petiolis 3–13 mm. longis pubescentibus; stipulis lineari-lanceolatis ca. 3.5 mm. longis acutis; pedunculis gracilibus 1–3 cm. longis unilateraliter 2–6-floris ex axillis superioribus orientibus; calyce 4–5 mm. longo stellato-setoso, fructifero 4–5 mm. lato, lobis 2–3 mm. longis ovatis acutis; bracteolis 3 lineari-filiformibus ca. 2 mm. longis; pedicellis setosis 0.5–1 mm. longis; corolla 4 mm. longa in sicco rosacea, lobis obovatis rotundatis; tubo stamineo 2 mm. longo; antheris 8–10; stylis ca. 1.5 mm. longis ca. 0.5 mm. longe connatis glabris linearibus; stigmatibus capitellatis hirtellis quam styli ramus paullo crassioribus; ovarii loculis 15–18; carpellis oblongo-ovatis 1–1.2 mm. altis ca. 1.5 mm. longis, sinu angusto longo, lateribus medium versus reticulato-rugosis marginem versus crasse rugosis, dorso sparse stellatis marginem versus saepe breviter cristatis, apice cum appendicula aristata hirsuta 2–3 mm. longa subpersistenti ornatis; spermatibus brunneis laevibus compressis pedicellato-ovatis vel cum sinu obliquo.—PERU: hillside on the south slope of Chachani Mountain near Arequipa, alt. 2100 m., March 1920, *Mr. & Mrs. F. E. Hinkley 43a* (TYPE, Gray Herb.).—In Baker's synopsis of the *Malvaceae*, Jour. Bot. xxix. 168 (1891), this species falls with *M. bolivianum* Baker, but that has much larger petals, much larger pinnatifid leaves, biaristate carpels, and taller growth.

Malvastrum congestiflorum, sp. nov., annuum herbaceum 1–3 dm. altum subsimplex; caulibus flexuosis decidue stellato-tomentosis apicem versus dense lanuginosis; foliis opacis sparse stellatis rhomboideo-ovatis acutis elobatis triplinerviis grosse sinuato-dentatis basin versus integris 2–5 cm. longis 1.5–3 cm. latis basi cuneatis, rare foliis palmato-trilobatis 2.5–4 mm. latis basi obtusis lobis obovatis grosse pauceque obtusidentatis; petiolis 5–20 mm. longis stellatis; stipulis ca. 5 mm. longis lanceolatis; floribus in glomerulos densos sessiles terminales 4–8-floros congestis; calyci ca. 5 mm. longi tomentosi lobis ovatis acutis ca. 3.5 mm. longis; bracteolis 3 linearibus 3–4 mm. longis; corolla pallida ca. 4 mm. longa calycem vix superante, lobis obovatis rotundatis 2.5–3 mm. longis; tubo stamineo 1.5 mm.

longo sparse longeque villoso; columna styli glabra ca. 1.5 mm. longa, lobis ca. 8 filiformibus 0.5–0.7 mm. longis sparse villosulis; stigmatibus capitellatis; ovario depresse globoso dense stellato-tomentoso; fructu ignoto.—PERU: rocky ravines on the south slope of Chachani Mountain near Arequipa, alt. 2745 m., March 1920, *Mr. & Mrs. F. E. Hinkley 37* (TYPE, Gray Herb.).—Apparently related to *M. tarapacanum* (Phil.) Baker, but distinguished by its larger green, rather than tomentose, foliage, pale corollas, and non-aristate fruit.

Malvastrum Shepardae, sp. nov., annuum humile herbaceum stellato-setosum 2–6 cm. altum multicaule; caulibus erectis vel decumbentibus teretibus viscido-villosis setosis; stipulis scariosis ciliatis 3–4 mm. longis 0.8–1 mm. latis; foliis subsemiorbicularibus vel late ovatis 1–2.5 cm. latis 1–2 cm. longis palmate lateque trilobatis vel irregulariter dentatis setosis subtus pallidioribus prominenter nervatis basi truncatis vel obtusis; petiolis 1–3 cm. longis; floribus axillaribus solitariis 2–5 mm. longe pedicellatis; calycibus ca. 5 mm. longis setosis, lobis oblongo-lanceolatis ca. 3.5 mm. longis acutis, fructiferis 5–6 mm. latis; bracteolis duabus 0.5–0.9 mm. infra calycem locatis; corollis purpureis ca. 5 mm. longis sepala ca. 1 mm. superantibus; tubo stamineo 1.5 mm. longo; stylo ca. 1.5 mm. longo, lobis ca. 1 mm. longis glabris vix dilatatis; stigmatibus capitellatis glabris; carpellis ca. 2.5 mm. longis 1.5 mm. latis glabris ovatis valde rugosis. —PERU: in meadows, Puno, Dec. 1919, *Mrs. R. S. Shepard 123* (TYPE, Gray Herb.).—Apparently a relative of *M. pygmaeum* (Remy) Gray, but differing from the description of that species in its acute calyx-lobes, pedicellate flowers, more numerous stamens, and glabrous fruit. Perhaps also related to *M. mollendöense* Ulbrich, but differing from the diagnosis of that species in having larger stipules, shorter pedicels, smaller flowers, smaller glabrate calyces, and leaves which are merely dentate or have three broad shallow palmate lobes. In naming this species for the collector it is a pleasure to give recognition to the botanical work of Mrs. Shepard who, in company with her husband, has for some years diligently prepared for the Gray Herbarium excellent specimens of the floras visited during her missionary work in the region west of Lake Titicaca and in Tacna-Arica.

Malvastrum catamarcense, sp. nov., annuum herbaceum stellatum 8–20 cm. altum basin versus longe ascendenterque ramosum; foliis 2–3.5 mm. longis 1.3–3 cm. latis rhomboideo-ovatis irregulariter inciso-serratis vel crenato-serratis, subtus pallidioribus dense stellatis prominenter nervatis supra plerumque setosis nervis immersis, basi truncatis vel late subcordatis, apice obtusis; stipulis lanceolatis 2–3

mm. longis; petiolis 1–2.5 cm. longis; inflorescentiis axillaribus, pedunculis gracilibus 8–16 mm. longis 1–3-floris; calycibus cupuliformibus ca. 4 mm. longis infra medium partitis lobis uninerviis stellato-setosis 2–3 mm. longis anguste acuteque ovatis; bracteolis lineari-filiformibus 2–3 mm. longis; petalis albis vel dilute rosaceis quam sepala 1/5–1/3 longioribus 3–3.5 mm. longis; tubo stamineo 2.5 mm. longo; stylo ca. 2 mm. longo, lobis 6–7 ca. 0.5 mm. longis glabris vix dilatatis; stigmatibus subcapitellatis glabris; ovario glabro; carpellis maturitate reniformibus glabris 2 mm. longis 1.2 mm. latis ca. 0.9 mm. crassis dorso convexis rugosis lateraliter laevibus; seminibus glabris reniformibus 1.2 mm. longis 9 mm. latis minute faveolatis brunneis.—ARGENTINA: El Candado, Dept. of Andalgalá, Prov. of Catamarca, Sept. 2, 1916, *Pedro Jörgensen 1388* (TYPE, Gray Herb.).—A very distinct addition to the rather small assemblage of annual Malvastrums. In Baker's synopsis of the *Malvaceae*, Jour. Bot. xxix. 168 (1891), the species falls with *M. peruvianum* (L.) Gray, from which it is unquestionably distinct differing in habit, cut of leaf, calyx, and pubescence. The conspicuous, slender, very few-flowered peduncles of *M. catamarcense* will usually serve to distinguish it.

Malvastrum Jorgensenii, sp. nov., annuum; radice erecta simplici, radicellis fibrillatis divaricatis; caulo erecto gracili subsimplici 4–6 dm. alto ad 3 mm. crasso basin versus suffruticuloso apicem versus folioso decidue stellato-tomentoso; foliis ovatis paucis acutis sparse stellatis 3-lobatis 4–7 cm. longis 3.5–5 cm. latis basi truncatis vel subcordatis subtus pallidioribus cum nervis prominentibus margine serrato-crenatis; petiolis 1.5–2.5 cm. longis; stipulis lanceolatis 1–2 mm. longis; inflorescentia terminali 10–30-flora congeste corymbosa; calyce dense stellato-tomentoso ca. 5–6 mm. longo, lobis deltoideis acutis 3–4 mm. longis, bracteolis linearibus 2–3 mm. longis; petalis laete roseis (in sicco coeruleis) ca. 1 cm. longis ca. 5 mm. latis oblongo-obovatis rotundatis quam calyx 2–3-plo longioribus; tubo stamineo ca. 6–7 mm. longo; stylo 2–2.5 mm. longo, lobis ca. 2 mm. longis stigma versus subdilatatis glabris; stigmatibus oblongo-capitellatis; ovario dense stellato-tomentoso cylindrato-globoso; fructibus ignotis.—ARGENTINA: near Suncho, Prov. of Tucuman, Sept. 5, 1915, *Pedro Jörgensen 1389* (TYPE, Gray Herb.).—Distributed as *M. peruvianum* (L.) Gray, and somewhat resembling that species in its subsimple habit. The new species has, however, smaller stipules, a tomentose rather than stellate-setose pubescence, and conspicuous corymbose rather than small unilaterally racemose flowers. *Malvastrum Jorgensenii* suggests *M. capitata* (Cav.) Griseb. in its floral structures, but that is a branched and densely tomentose shrubby perennial.

Monnina ramosa, sp. nov., fruticulosa 15–20 cm. alta laxe ramosa paullo canescens adpresse compresseque albo-villosa ut videtur furfuracea (?) annua; foliis lanceolato-linearibus 15–25 mm. longis 1.5–2.5 mm. latis obtusis integerrimis concoloribus basi attenuatis; petiolis 0.5 mm. longis; stipulis nullis; inflorescentia racemosa 5–10 cm. longa ca. 1 cm. longe pedunculata ramulos laterales terminanti pedicellis ca. 0.7 mm. longis; sepalis ciliato-fimbriatis duobus inferioribus ovatis acutis basim versus connatis ca. 1.7 mm. longis, superiori lanceo-ovata 2 mm. longa; alis albis oblique obovatis 4–4.5 mm. longis 2–2.2 mm. latis basi deltoideis; carina (in sicco) aurea emarginata orbiculari plicata a latere visa oblonga 4–5 mm. longa ca. 2.5 mm. alta obtusa; petalo superiori albo obtuso ligulato; androecio paullo ciliolato; staminibus 8; ovario glabro; stigmate inferiori tuberculato horizontali; samara oblique obovata membranacea in lateribus medium versus dense albo-strigosa, ala undulata evidenti.—PERU: on sandy pampa at 3300 m. alt. on south slope of Chachani Mountain near Arequipa, March 1920, *Mr. & Mrs. F. E. Hinkley 13* (TYPE, Gray Herb.).—Related to *M. Weberbaueri* Chodat, Engler Jahrb. xlii. 102 (1908), a species of central Peru, from which it differs in its more elongate narrower leaves, glabrate stigma, and differently shaped floral keel.

Oenothera verrucosa, sp. nov., annua herbacea pilosa erecta simplex foliosa 5–25 cm. alta; foliis 2.5–6 cm. longis 5–9 mm. latis inconspicue undulatis vel denticulatis concoloribus marginem versus pubescentibus, infimis spathulato-oblanceolatis petiolatis, superioribus lanceolatis sessilibus basi rotundatis vel cordatis; floribus axillaribus; alabastro erecto ellipsoideo villoso ca. 1 cm. longo; hypanthio infundibuliformi usque ad ca. 3 mm. longo paullo longiori quam lato; sepalis in alabastro apice libris, anthesi separatim reflexis linearilanceolatis; petalis luteis obcordatis ca. 5 mm. longis ca. 3 mm. latis; staminibus glabris ut videtur 2-seriatis; antheris anguste oblongis dorsaliter medium versus adfixis; stylo glabro ca. 3 mm. longo; stigmate 4-lobato lobis ligulatis 1–1.3 mm. longis; ovario viscido-villoso; capsulis 15 mm. longis 2–3 mm. crassis sparse villosis oblanceolato-fusiformibus obtusi-quadrangularibus, valvis verrucosis medialiter longitudinaliterque costatis; seminibus erectis uniseriatis ellipsoideis pallidis 1–1.4 mm. longis vix rugosis.—PERU: ravines and rocky slopes at 3600 m. alt. on southern slope of Chachani Mountain near Arequipa, March 1920, *Mr. & Mrs. F. E. Hinkley 17* (TYPE, Gray Herb.).—Certainly a near relative of *Oe. coquimbensis* Gay, from which it differs in its narrower more elongate leaves, and short

hypanthium. From descriptions it seems to be also closely related to the Chilian *Oe. bracteata* Phil., but it differs from that in having a lower stature, more elongate leaves, smaller flowers, and a sparse villous pubescence. The new species is locally known a "chochillo," and is used for urinal troubles.

Jarrilla, nom. nov. *Mocinna* La Llave, Registro Trimestre i. 351 (1832); not *Mocinna* Lag. Gen. et Sp. Pl. Nov. 31 (1816); nor *Mozinna* Ort. Nov. Pl. Descr. Decad. 104 (1798).—The generic name given by La Llave is not only later than the exactly homonymous one proposed by Lagasca, which is now referred to *Calea,* but is later also than the practically homonymous one published by Ortega. La Llave and Ortega both dedicated their names to Don José Mociño, latinizing the latter's name slightly differently. Ortega's genus has been accepted as valid by some recent authors and has appeared in print, at least once, Benth. Pl. Hartw. 9 (1839), spelled "*Mocinna.*" I am therefore discarding the generic name given by La Llave, since it is essentially homonymous, being the same in origin and intent, and since its acceptance would lead to confusion. The generic name substituted is formed from one of the vernacular names given by La Llave. The genus *Jarrilla* evidently belongs to the *Caricaceae* and its recognition adds a fourth well-marked genus to the family. It appears to be most closely related to *Carica,* but differs in having low herbaceous stems, tuberous-thickened roots, and cornutely appendaged fruit. Ramírez, Anal. Inst. Med. Nac. Mexico i. 209–211 (1894) and Naturaleza ser. 2, ii. 449–450 (1894), has excellently shown the numerous characters of the genus by means of a tabular comparison.

Jarrilla heterophylla (La Llave), comb. nov. *Mocinna heterophylla* La Llave, Registro Trimestre i. 351 (1832); Naturaleza ser. 1, vii. append. 70 (1887). (?) *Carica nana* Benth. Pl. Hartw. 288 (1848). *M. heterophylla,* var. *Sesseana* Ramírez, Anal. Inst. Med. Nac. Mexico i. 207, t. 1–4 (1894); Naturaleza ser. 2, ii. 447, t. 25–26 (1894). *C. caudata* Brandg. Zoe iv. 401 (1894).—The type of this very variable species is said to have come from Guanajuato, Mexico. Its description agrees well with the plates of Ramírez's variety *Sesseana* which presumably was based upon cultivated material from Guanajuato furnished by Dugès. The species as here accepted is quite variable as to foliage. The Jalisco plant figured as typical *M. heterophylla* by Ramírez has sagittate or definitely hastate leaves and may be distinct. I have seen a quite similar plant collected at La Palma, Jalisco, in 1892 by M. E. Jones (no. *7331a*). The type of Brandegee's species comes from the mountains of southern Lower California.

Jacaratia costaricensis, sp. nov., dioica arborea pyramidalis; ramis brunneis aculeatis; aculeis acutis duris ca. 2 mm. altis conicis vel lateraliter compressis; foliis herbaceis longe petiolatis digitatis ambitu rotundatis 10–15 cm. diametro; petiolis 10–16 cm. longis; foliolis 5–7 oblanceolatis integerrimis acuminatis, supra viridibus subtus densissime glaucis; foliolo centrali 6–11 cm. longo 2–3 cm. lato cum petiolulo 2–3 mm. longo; inflorescentiis masculis axillaribus petiolo brevioribus 6–12 cm. longis laxe racemosi-paniculatis multifloris, femineis axillaribus erectis longe pedunculatis unifloris; floribus masculis ca. 17 mm. longis extus glaucissimis, in alabastro tenuiter clavatis, lobis ca. 7 mm. longis linearibus subobtusis, tubis tenuiter cylindratis ca. 1.2 mm. crassis intus sparse villosis, staminibus extus strigosis valde inaequalibus, filamentis conspicue connatis, antheris similibus sine connectivo ligulato, processis erectis spiniformibus; floribus masculis ca. 2.7 cm. longis glaucis, tubo ca. 2 mm. longo ca. 6 mm. crasso.—Costa Rica: forest of Las Vueltas, Tucurrique, 650–700 m. alt., Dec. 1898, *Adolfo Tonduz 12881* (type, Gray Herb.).—*Jacaratia costaricensis* is evidently a close relative of the Guianian, *J. spinosa* (Aubl.) DC., but differs from that species in its longer (5–9 mm. long) fruiting peduncles, and very strikingly bicolored foliage. The new species is quite unique in the genus on account of its excessively glaucous flowers and lower leaf-surfaces. The vernacular name given by Senior Tonduz is "papayillo de venado."

Pileus mexicanus (A. DC.), comb. nov. *Jacaratia mexicana* A. DC. Prodr. xv. pt. 1, 420 (1864); Calq. Fl. Mex. t. 1163–1164 (1874). *J. conica* Kerber, Jahrb. Bot. Gart. Berlin ii. 282, t. 9 (1883). *Carica heptaphylla* Sesse & Moc. Pl. N. Hisp. 172 (1887); not Vellozo (1827). *P. heptaphyllus* Ramírez Anal. Inst. Med. Nac. Mexico v. 28, t. 1–4 (1901); Naturaleza ser. 2, iii. 707, t. 41–45 (1903).—In its alate or strongly costate fruit and in its quite anomalous habit this species differs strikingly from all other members of the *Caricaceae*, and appears to merit well the generic rank accorded it by Dr. Ramírez. There are, however, two names older than the particular one taken up by Ramírez; the above combination being the proper one. The species has been almost universally referred to *Jacaratia*, but in habit it is anomalous in that genus and in addition differs in having unarmed branches and non-connate stamens. The plant differs from *Carica* in its habit, divided leaves, costate or angled fruit, and oppositisepalous corolla-lobes. It differs from *Jarrilla* in its habit, 5-celled costate or alate non-cornute fruit, divided leaves, oppositisepalous corolla-lobes, and linear (not lingulate) glabrous stigmas. Ramírez

reports the plant from the state of Morelos and Guerrero. Kerber collected it in Colima and mentions a collection from Campeche. I have seen a specimen (*Millspaugh 96* in part, mixed with *Jatropha Gaumeri* Greenm.) from between Merida and Izamal, Yucatan.

Caiophora (§ **Bicallosae**) **Jorgensenii**, sp. nov., volubilis; foliis oblongis vel late lanceolatis acutis pinnatisectis vel pinnatilobatis 2.5–5.5 cm. longis 1–3 cm. latis 3–6 mm. longe petiolatis, lobis acutis oppositis vel subalternis serratis; floribus axillaribus solitariis 5-meris; pedicellis florigeris tortuosis 10–15 mm. longis, fructiferis ca. 25 mm. longis apicem versus cernuis; hypanthiis hirsutis graciliter cylindratis ad basin sensim attenuatis ca. 8 mm. longis ca. 2 mm. crassis, lobis linearibus ca. 4 mm. longis ca. 0.5–0.7 mm. latis; petalis patentibus 8–10 mm. longis late navicularibus extus setosis; squamis pubescentibus 3–4 mm. longis ca. 2–2.5 mm. latis a latere visis semi-lunatis a dorso ovato-oblongis sub collo callos 2 valde incrassatos decurrentes transversos gerentibus apice valde bicalloso-incrassatis, nervis 3 ad $\frac{3}{5}$ altitudinis squamae filum emittentibus, filis 3 filiformibus basin versus paullo dilatatis squamas paullo vel vix superantibus; staminodiis 2 subulatis gibbere papillosis tortuosis 4–5 mm. longis quam squama sensim longioribus; filamentis numerosis; capsulis cylindro-claviformibus inferne in pedicellum attenuatis 2–2.5 cm. longis 4–5 mm. crassis nutantibus setosis conspicue spiraliterque contortis; seminibus 0.6–1 mm. longis ca. 0.6 mm. diametro pallide brunneis faveolato-reticulatis irregulariter alatis.—ARGENTINA: El Candado, Dept. of Andalgalá, Prov. Catamarca, Jan. 16, 1916, *Pedro Jörgensen 1163* (TYPE, Gray Herb.).—This species is evidently a close ally of *C. stenocarpa* Urb. & Gilg, and *C. Arechavaletae* Urb., and has a range geographically intermediate between these species. It differs from *C. stenocarpa* in its smaller solitary axillary flowers, elongate pedicels, and evidently contorted capsules. From *C. Arechavaletae* it differs in its shorter petioles, smaller less deeply cut narrower leaves, solitary axillary flowers, and longer more slender capsules. In *C. Jorgensenii* the scales in the flower appear to be nearly intermediate between the conditions illustrated by Urban & Gilg, Monog. Loasac. t. 8, fig. 4 and 7 (1900), for its near relatives. The staminodia in the proposed species are subulate, tapering very gradually from the broadened base. About 1 mm. above the base, and slightly below the first bend, the staminodia are provided with a pair of spreading linear coarsely and densely villous appendages about 1 mm. long. Above the attachment of the appendages the pale staminodia is covered to the very tip with gibbous tuberculations.

The staminodia in *C. Jorgensenii* is hence quite different from those of *C. stenocarpa* and *C. Arechavaletae* as illustrated by Urban & Gilg, l. c. fig. 6 and 8.

Gilibertia amplifolia, sp. nov., arborea glaberrima; ramis cortice griseo spongioso tectis; foliis paucis ovatis vel oblongo-ovatis coriaceis undulatis vel sinuatis obtusis 15–18 cm. longis 9–11 cm. latis conspicue nervatis bicoloribus basi rotundatis vel abrupte cuneatis; petiolis 6–7 cm. longis; inflorescentia terminali pyramidaliter paniculata, rachibus crassis ca. 3.5 cm. longis, bracteis conspicuis latis persistentibus saepe ad 2–3 mm. longis; ramulis primariis patentibus 2.5–3.5 cm. longis inarticulatis bracteatis; pedunculis 1–3 cm. longis saepe medium vel basin versus bracteolatis; capitulis 10–20-floris; pedicellis 1.5–2.5 mm. longis; hypanthiis anguste obconicis; corollis 5-meris; alabastris subglobosis; petalis saepe ca. 2.5 mm. longis anguste triangularibus crassiusculis acutis quam stamina paullo brevioribus; ovario glabro; baccis ca. 5 mm. longis 4 mm. latis valde 5-costatis; stylis medium versus connatis apice valde recurvatis.—COLOMBIA: Santa Marta, alt. 1200 m., Feb. 1898–1901, *H. H. Smith 1778* (TYPE, Gray Herb.).—Related to *G. arborea* (L.) March., but differing in having short pedicels, paler broader leaves, and a more compound inflorescence with a thicker main axis.

Gilibertia Smithiana, sp. nov., arbor glaberrima; foliis oblongis vel elliptico-oblanceolatis 2 dm. longis 4–7 cm. latis margine obscure crenatis et involutis, basi cuneatis vel rotundatis, apice valde acuminatis, subtus pallidioribus valde nervatis; petiolis saepe 3–8 cm. longis; racemis terminalibus, rachibus 2–6 cm. longis gracilibus erectis, pedunculis gracilibus elongatis non articulatis ima basi et medium versus bracteas breves ovatas concavas acutas gerentibus; calycis late obconici lobis acutis; corolla sphaerica paullo depressa, petalis deltoideo-ellipticis acutis uninerviis crassiusculis purpureis ca. 1.5 mm. longis stamina paullo superantibus; stylis sub anthesi in conum rugosum diametro disci circiter aequantem connatis maturitate valde recurvatis; ovariis glabris; baccis globosis laevibus 5–6 mm. longis.—GUATEMALA: Cubilquitz, Dept. Alta Verapaz, alt. 350 m., Aug. 1907, *von Türckheim 11407* (TYPE, Gray Herb.); Aug. 1901, *von Türckheim 7882*. HONDURAS: San Pedro Sula, Dept. Santa Barbara, alt. 500 m., *Thieme 5253*. MEXICO: Misantla, Vera Cruz, Aug. 1912, *Purpus 5917;* (?) Cerro del Boqueron, Chiapas, June 1914, *Purpus 7363*.—Related to the Antillean *G. arborea* (L.) March. under which name it has been distributed by Captain John Donnell Smith and treated in his key, Bot. Gaz. lv. 436 (1913), to the Central American species of

the genus. *Gilibertia Smithiana*, however, differs from its West Indian relative in having smaller flowers in a more slender less projected inflorescence, and in possessing less firm usually more elongate leaves. The only specimen of *G. arborea* in the Gray Herbarium from Central America is *Fendler 131* from Panama.

Gilibertia eurycarpa, sp. nov., arborea; ramis cortice griseo longitudinaliter sulcato tectis; foliis glaberrimis saepe obtuse breviterque acuminatis integerrimis, subtus pallidioribus costa prominenti et nervis ascendentibus arcuatis ad basin inferioribus cum costa decurrentibus, foliis ramulorum juvenum 3–5-palmato-lobatis cum petiolis 2 dm. longis, eis ramulorum maturorum ovatis acutis vel obtusis 10–15 cm. longis 5–11 cm. latis basi cuneatis; umbellis 25–40-floris in racemum 2–5 cm. longum axillarem digestis; pedunculo 4–5 cm. longo gracili medium versus bracteis brevibus ovatis concavis acutis instructo, apice in receptaculum hemisphaericum mediocre dilatato; floribus 5-meris, pedicellis filiformibus ca. 7 mm. longis bracteolis scariosis ferrugineis brevissimis basi stipatis; tubo calycis obconico, limbo anguste triangulari 1.52 mm. longo; corolla hemisphaerica paullo depressa; petalis ovatis vel triangulari-ovatis acutis ca. 2 mm. longis; staminis filamento flexuoso petalis longiore; stylis valde arcuato-reflexis basin versus connatis; bacca oblate globosa ca. 5 mm. longa cum exocarpio corrugato; pedicellis 8–10 mm. longis.—MEXICO: Tamasopo Canyon, San Luis Potosi, *Pringle 3723* (TYPE, Gray Herb.); Gómez Fárias, Tamaulipas, ca. 350 m. alt., *Palmer 275, 312*.—The species is related to *G. stenocarpa* Donn. Sm. of Guatemala and Salvador, but differs in its globose fruit, shorter style, and more uniform leaves. It is also a close relative of *G. insularis* Rose of the Tres Marias Islands, but differs from the description of that species in having larger looser inflorescence with longer pedicels and peduncles, and in having larger fruit and strongly recurved styles.

Gilibertia alaris (C. & S.), comb. nov. *Hedera alaris* C. & S. Linnaea ix. 605 (1835).

Gilibertia darienensis (Seem.), comb. nov. *Dendropanax darienense* Seem. Jour. Bot. ii. 300 (1864).

Gilia chachanensis, sp. nov., glabra glandulosa 15–20 cm. alta stricte vel ascendenter ramosa suffruticulosa (?) annua; ramis numerosis, inferne pallidis nudis, superne brunnescentibus vel viridibus gracilibus rigidusculis foliosis; foliis 1–2 cm. longis integris vel palmatifidis vel varie pinnatifidis, lobis paucis linearibus 0.5–1 mm. latis 5–18 mm. longis compressis vix dilatatis firmiusculis cuspidatis sparse glandulosis; floribus foliis oppositis solitariis; pedicellis ascendentibus

1–3 (saepius 2–3) cm. longis glandulosis; calyce campanulato viscido-glanduloso 4–5 mm. alto ca. 2 mm. crasso, lobis triangulari-lanceolatis ca. 1.5 mm. longis; corolla glaberrima ca. 9 mm. longa hypocrateriformi, tubo calycem paullo superanti albo, lobis ovalibus ca. 2.5 mm. longis purpurascentibus; staminibus infra medium tubo corollae adfixis; filamentis tubum corollae superantibus filiformibus 3.5 mm. longis; antheris orbicularibus 0.3–0.4 mm. diametro basi adfixis; stylo 2 mm. longo; stigmatibus lanceolatis ca. 1 mm. longis; loculis ovarii multiovulatis; capsula cylindrato-ovoidea 4–5 mm. longa sepalis paullo breviori polysperma; seminibus brunneis oblongis sub aqua spirilliferis.—PERU: on a sandy pampa at 3300 m. alt. on the south slope of Chachani Mountain near Arequipa, March 1920, *Mr. & Mrs. F. E. Hinkley 25* (TYPE, Gray Herb.).—The above species belongs to the § *Eugilia* and is clearly a member of that small group of South American species centering around *G. laciniata* R. & P. In Brand's monograph, Pflanzenr. iv. Fam. 250, 95 (1907), it keys out with *G. laciniata*. It differs from that, however, in its very slender glabrous habit, long filaments, solitary long-pedicellate flowers, and linear or simply cleft very slender elongate glabrous leaves. The stems of *G. chachanensis* are very slender, rather rigid, and towards the ground slightly fruticulose. The plant is absolutely glabrous but is sprinkled over with short-stipitate glands, and the upper parts are somewhat viscid. It bears the local name of "romerito del cerro."

Patima formicaria, sp. nov., fruticosa ca. 2.4 dm. alta; caulibus 1–5 erectis simplicibus fistulosis tetragonis obtuse angulatis 8–12 mm. crassis in lateribus longitudinaliter sulcatis; foliis herbaceis obovato-ellipticis vel late oblongeque obovatis 30–45 cm. longis 12–17 cm. latis integerrimis apice cum acumine 15–25 mm. longo falcate acuminatis basi cuneatis vel attenuatis subtus pallidis sparse puberulentis, nerviis 30–40 arcuate laxeque ascendentibus; petiolis 4–7 cm. longis lateraliter compressis angulatis; stipulis 4–5 mm. longis lineari-attenuatis vel lanceolatis crassis; inflorescentia glabra axillari; axillis cum 1–3 uni- vel quadri-floris 1 mm. longe pedunculatis umbellis ornatis; pedicellis 4–8 mm. longis; hypanthio glabro hemisphaerico ca. 2 mm. alto; ovario multiovulato multiloculari (?); calyce glabro integro 1.5–2.5 mm. alto cupuliformi; corolla 2.5–2.8 mm. longa firma citrea vel (in saltem sicco) rubiginosa extus glabra, tubo cylindrico ca. 1.5 mm. longo ca. 4 mm. crasso intus glabro supra in fauces infundibuliformes 8–10 mm. longas usque ad 8–10 mm. crassas intus aureo-villosas ampliato, lobis deltoideis ascendentibus graciliter acuminatis in alabastro paullo lateraliter imbricatis ca. 3.5 mm. latis; staminibus glabris inclusis in

faucibus ad corollam affixis; filamentis ligulatis paullo attenuatis 2–2.2 mm. longis; antheris lanceo-linearibus ca. 4 mm. longis basi emarginatis apice acuminatis; stylo corolla breviori tereti glabro ca. 1.5 mm. longo, stigmatibus ligulatis ca. 2.7 mm. longis; bacca 6–7 mm. crassa 5–8 mm. alta; seminibus subglobosis brunneis ca. 0.5 mm. diametro foveolatis.—British Guiana: Tumatumari, Potaro River, lat. 5° 20′ N., June 1920, *Hitchcock 17348* (type, Gray Herb.); clayey hills at mouth of Merumé Creek, 5° 53′ N., 59° 52′ W., Dec. 1922, *H. O. Lang 330* and *339*.—Evidently related to *P. guianensis* Aubl., Pl. Guian. 196, t. 77 (1775) and Hoffm. in Mart. Fl. Brasil. vi. pt. 6, 309 (1889), but having taller tetragonal stems, larger long-acuminate leaves, larger flowers, and smaller apparently many-celled fruit. According to Dr. W. M. Wheeler, to whom the Gray Herbarium is indebted for excellent material of the species, the plant is myrmecophilous, its fistulous stems being the habitation of at least five species of ants.

Gnaphalium microcephalum Nutt. Trans. Am. Philos. Soc. ser. 2, vii. 404 (1841). *G. bicolor* Bioletti, Erythea i. 16 (1893).—A photograph of the type of Nuttall's *Gnaphalium microcephalum* has been recently received from the British Museum. A study of this photograph shows conclusively that the species has been universally misinterpreted and that it clearly represents the species well known to Californian botanists as *G. bicolor* Bioletti. The species of Southern California which has been mistaken for the Nuttallian species is hence without a name and may be called:—

Gnaphalium albidum, sp. nov., perenne 5–9 dm. altum; caulibus numerosis dense tomentosissimis laxe ramosis, foliis oblanceolatis vel spathulatis late adfixis saepe subdecurrentibus 3–5 cm. longis 5–10 mm. latis acutis tomentosis supra paullo viridioribus; capitulis 5–6 mm. altis ca. 4 mm. diametro in glomerulos lanugineos terminales congestis; tegulis ca. 18 albidis 3-seriatis, exterioribus ovatis acuminatis, interioribus oblongis acutis; floribus perfectis 3.5 mm. longis 5–6, imperfectis 35–40; pappi setis ca. 20 distinctis ca. 4 mm. longis barbatis; achaeniis glabris oblongis ca. 0.6 mm. longis.—California: in the chaparral, Granite, San Diego Co., 550 m. alt., July 11, 1916, *Mary F. Spencer 69* (type, Gray Herb.); grassy hillside, Laguna Mts., San Diego Co., *Spencer 1034;* border of stream, San Bernardino Mountains, *Parish Bros. 579;* Pasadena, *Grant 518;* Mission Canyon, Santa Barbara Co., *Eastwood 124*.—This species is confined to the coastal drainage of Southern California where it is most common in gravelly places on the alluvial fans along the base of

the mountains, and in open places in the chaparral belt in the foothills or at low altitudes in the mountains. It is probably most related to *G. Wrightii* Gray, a species of northern Mexico and New Mexico, which has smaller heads, more acute tegules, more slender stems, and a much less dense tomentum on its stems and foliage.

GNAPHALIUM BENEOLENS Davidson, Bull. So. Calif. Acad. Sci. xvii. 17 (1918).—LOWER CALIFORNIA: San Vicente, *Orcutt 1241*. CALIFORNIA: Saratoga, San Diego Co., *Spencer 166;* Palomar, *Spencer 1043;* Crescenta, *Burlew 3275* (ISOTYPE); Converse Basin, Fresno Co., *Dudley 3397;* Yosemite, 1877, *Hooker & Gray;* Del Monte, *Elmer 4038;* Black Mt., Santa Clara Co., *Baker 1542;* Mt. Tamalpais, *Eastwood 1501;* near Forest Ranch, Butte Co., *Heller 12659*. NEVADA: Bowers, *Heller 10659;* near Carson City, *Anderson 19*.—This species seems properly to include almost all that material from middle and northern California, and most of that from Southern California, which in the past has gone as *G. microcephalum*. It differs from *G. albidum* in its narrow linear elongate leaves and larger usually stramineous heads. In Southern California where *G. albidum* and *G. beneolens* both occur, the latter appears to flower later, to be more common, and to reach its optimum development at lower altitudes growing in the broad warm valleys and low foothills. The two species have very different habits, at least in Southern California. *Gnaphalium albidum* branches more, particularly towards the base, and has somewhat decumbent stems, and consequently has a decidedly loose habit. On the other hand *G. beneolens* is stiffly erect, with little branching towards the base, and forms close trim clumps. The difference in foliage between the species, while occasionally obscure in very mature specimens, is remarkably accentuated on the vigorous young flowerless shoots.

GNAPHALIUM THERMALE E. Nels. Bot. Gaz. xxx. 121 (1901).—WYOMING: on the formations, Norris Geyser Basin, Yellowstone Park, *Nelson 6139* (ISOTYPE). IDAHO: Lake View, Kootenai Co., *Sandberg, MacDougal & Heller 872;* Trinity, Elmore Co., *Macbride 529*. BRITISH COLUMBIA: vicinity of Nanaimo, Vancouver Isl., *Macoun 430*. WASHINGTON: New Port, *Kreager 454;* Peshastin, *Sandberg & Leiberg 830;* Friday Harbor, San Juan Islands, *Zeller 1213*. OREGON: Kamela, *Peck 4672;* Detroit, *Nelson 1912*. CALIFORNIA: near Deetz Station, Siskiyou Co., *Heller 11702;* Truckee, *Heller 7092;* Bear Valley, San Bernardino Mts., *Abrams 2888*.—Although grossly inappropriate, the above name seems the only one correctly applicable to the plant of northwestern United States now current as *G. microcephalum*. The plant in question is a well marked one and ranges from western

Wyoming to Oregon and southern British Columbia and thence southward along the Sierra Nevadas to Southern California. It appears to be most related to *G. Wrightii* of Mexico and New Mexico, but differs in its very different distribution, smaller heads, and sharply acute usually stramineous tegules. *Gnaphalium thermale* is readily distinguished from *G. beneolens* by its very conspicuously smaller heads and northern range. In California where the two latter species both occur, *G. thermale* grows on the mountains in the pine belt at altitudes much higher than *G. beneolens*.

Gnaphalium texanum, sp. nov., perenne 3–4 dm. altum; caulibus compluribus laxe ramosis dense tomentosis foliis numerosis oblanceolatis vel oblanceo-linearibus 3–7 mm. latis 1.5–4 cm. longis acutis late affixis, subtus tomentosis, supra sparse decidueque tomentosis; capitulis 4–5 mm. altis 2–2.5 mm. diametro in glomerulos lanuginosos densissimos congestis; tegulis 18–20 albidis 3-seriatis interioribus oblongis acutis, exterioribus ovatis acuminatis tomentosis; floribus perfectis 2.5 mm. longis 8–10, imperfectis ca. 40; pappi setis ca. 18 distinctis ca. 3 mm. longis subnudis; achaeniis glabris oblongis ca. 0.5 mm. longis.—TEXAS: mouth of Tarlinga Creek, Brewster County, Sept. 1883, *V. Havard 26* (TYPE, Gray Herb.); rocky soil, lower slopes, Davis Mts., Aug. 20, 1915, *without collector*.—Although passing as *G. Wrightii* Gray, this species seems unquestionably distinct, differing in its stiff habit and branching, narrow leaves, and particularly in having its small heads crowded into tight capitate clusters terminating short leafy branches. The new species appears to replace *G. Wrightii* in Texas.

Gnaphalium viridulum, sp. nov., bienne 2–4 dm. altum; caulibus compluribus erectis simplicibus vel rariter laxe ramosis tomentosis; foliis oblanceolatis superioribus gradatim reductis late affixis 2–6 cm. longis 4–10 mm. latis, apice acutis cuspidatis, subtus dense tomentosis, supra paullo viridioribus; inflorescentia dense corymbosa; capitulis 4–5 mm. altis 2–3 mm. diametro in glomerulos densos congestis; tegulis ca. 18 albidis basem versus viridulis 3-seriatis exterioribus ovatis acutis sparsissime laxeque tomentosis, interioribus oblongis acuminatis; floribus perfectis 5–6 ca. 3.5 mm. longis, imperfectis 30–35; pappi setis ca. 15 distinctis solitariter deciduis ca. 4 mm. longis antrorse hispidulis; achaeniis glabris oblongis 0.6 mm. longis.—NEW MEXICO: Bear Mts. near Silver City, 2400 m. alt., Sept. 19, 1903, *O. B. Metcalfe 742* (TYPE, Gray Herb.). ARIZONA: Gooseneck, Paradise, Chiricahua Mts., 1950 m. alt., *Blumer 2207;* Tucson, 1907, *Loyd*.—This species has been confused with *G. Wrightii* although dif-

fering in its lower stature, smaller cylindrical greenish heads, and less sharply acute partly green tegules. The plant has a characteristic habit. It appears to range more to the westward than does *G. Wrightii* and perhaps replaces it in Arizona.

GNAPHALIUM USTULATUM Nutt. Trans. Am. Philos. Soc. ser. 2, vii. 404 (1841).—It has been the current practice to apply the name *G. purpureum* L. to an indigenous plant which ranges along the Pacific Coast from British Columbia to Southern California and seemingly reappears in Arizona and northern Mexico. Comparison of this plant with the true *G. purpureum* of eastern United States shows the former to be uniformly coarser, to have a much looser tomentum, and a broader dense stout somewhat leafy spike of commonly brown heads. The plants from the two coasts are readily recognized and may be quickly separated merely on their difference of gross habit and aspect. A study of the photograph of Nuttall's type of *G. ustulatum*, recently received from the British Museum, shows that both of the specimens cited by Nuttall clearly belong to the Pacific Coast plant and hence that his name is properly applicable to the "*G. purpureum*" of Californian authors. Although Nuttall cites one specimen as collected "On the plains of the Platte, towards the Rocky Mountains" the species is not known there, and it seems almost certain that the locality is the result of mislabeling. In Southern California *G. ustulatum* is not known south of Santa Barbara and Santa Rosa Island. The specimens from San Diego and Claremont cited by Hall, Univ. Calif. Pub. Bot. iii. 111 (1907), represent the amphigean weed, *G. spathulatum* Lam., a plant readily recognized by its distinctly annual weedy habit, floccose greenish foliage, and yellowish or greenish heads embedded in tomentum.

3. A NEGLECTED PAPER BY JEAN LOUIS BERLANDIER.

It was recently discovered that the library of the Gray Herbarium contained copies of a sixteen page brochure, apparently written by J. L. Berlandier, which seems to have escaped the notice of recent authors. The title-page of the paper reads: Memorias | de la | Comision | de | limites | a | las ordenes del | General Manual de Mier y Teran. The first numbered page bears at its head: Memorias de la Comision | de limites. | Historia Natural | Botanica. | por | El General Teran y L. Berlandier. The preface is dated thus: Matamoros de las Tamaulipas Junio 20 de 1832. The commission referred to is evidently that which, according to Bancroft, Hist. Mex. v. 154 (1885), was appointed "in 1827, with General Manual Mier y Teran

as its chief, to ascertain the boundary between the Mexican and American republics under the treaty of 1819." According to Alcocer, Naturaleza ser. 2, iii. 556–557 (1901), the commission operated as late as 1830 or 1831. Since the date to the preface of the botanical report is over a year after the disbanding of the commission, it seems probable that the time mentioned is within a year, if not a month, of the exact date of publication, since the paper is a small one and especially since certain crudities in printing suggest that it was printed (in all probability very promptly) on some frontier press such as would have been found at that period in Matamores. The brochure is hence taken as having been published in 1832.

In substance the paper consists of dual Latin and Spanish descriptions of eleven newly proposed species and four new genera. The descriptions are carefully prepared and are evidently the work of Berlandier. The identification of the proposed genera and species, which appear to have been completely neglected and which are not listed in the Kew Index, has been greatly facilitated by the specimens from the Berlandier herbarium now preserved in the Gray Herbarium. These in a number of cases are labeled in Berlandier's handwriting with the names published in the brochure. Further help has been derived from the volume of Berlandier's unpublished plates, now preserved in the library of the Gray Herbarium. In the present paper these plates are cited: Berl. Icon. Ined. It seems probable that the brochures and the Berlandier manuscripts all came to the Gray Herbarium through the gift of Dr. Short under the conditions mentioned by Gray, Am. Jour. Sci. ser. 2, xxxv. 16 (1863).

Rivina vernalis Teran & Berl. Mem. Comision Limites 1 (1832); Berl. Icon. Ined. no. 1, pt. 1, t. 3, fig. 3.—"Crescit in locis sterilibus siccis humidisve, prope Matamoros de las Tamaulipas." = R. HUMILIS L. Sp. Pl. 121 (1753).

Cactus bicolor Teran & Berl. Mem. Comision Limites 1 (1832); Berl. Icon. Ined. no. 1, pt. 2, t. 4; no. 6, t. 4.—"Crescit in locis siccis sterilibusque prope Matamoros de las Tamaulipas." = **Hamatocactus bicolor** (Teran & Berl.), comb. nov. *Echinocactus setispinus* Engelm. Bost. Jour. Nat. Hist. v. 246 (1845).—Britton & Rose, Cactaceae iii. 105 (1922), say that *E. setispinus* is "very different from *Cactus bicolor* Berlandier." Berlandier's description, however, agrees very closely with their description of Engelmann's species, while pencilings on Berlandier's plates, which certainly represent the species as illustrated by Britton & Rose, show that Engelmann also considered his species synonymous soon after the publication of the latter.

CACTUS CHLORANTHUS Teran & Berl. Mem. Comision Limites 3 (1832); Berl. Icon. Ined. no. 1, pt. 2, t. 3.—"Crescit in locis sterilibus siccisve prope Matamoros de Tamaulipas." This species is a Mammillaria apparently belonging to the genus *Escobaria* of Britton & Rose, Cactaceae iv. 53 (1923).

CACTUS TAMAULIPENSIS Teran & Berl. Mem. Comision Limites 3 (1832).—"Crescit in locis sterilibus inter ripam fluvii dicti Rio Bravo del Norte et locum dictum arroyo colorado prope Matamoros de las Tamaulipas." Unrecognized.

Terania frutescens Berl. in Teran & Berl. Mem. Comision Limites 4 (1832); Berl. Icon. Ined. no. 6, t. 2.—"Habitat in regionibus septentrionalibus et orientalibus Reipublicae Mexicanae; prope San Antonio de Bejar in Texas, circa Monterrey in Nuevo Leon, prope Matamoros et Victoria in Tamaulipas." Berlandier's genus, *Terania*, is evidently a late synonym of *Leucophyllum*, but his species is some years older than *L. texanum* Benth. in DC. Prodr. x. 344 (1846). The correct name for the plant is, therefore, **Leucophyllum frutescens** (Berl.), comb. nov.

Gaza anacua Teran & Berl. Mem. Comision Limites 5 (1832); Berl. Icon. Ined. no. 4, t. 9.—"Habitat in locis siccis humidive; in Texas prope la Bahia del Espiritu Santo; in Tamaulipas prope Matamoros ubi vulgo adpellatur Anacua." The genus *Gaza*, described at the above citation, is a synonym of *Ehretia*. The species, *G. anacua*, however, is an older name for the plant current as *E. elliptica* DC. Prodr. ix. 503 (1845), which therefore should be called **Ehretia anacua** (Teran & Berl.), comb. nov.

Chrysodendron tinctoria Teran & Berl. Mem. Comision Limites 7 (1832).—"Habitat in locis umbrosis montium dictorum Sierra de Tamaulipas del norte, prope San Carlos et San Nicolas, et forsan in omnibus montibus del Nuevo Leon prope Monterrey. Vulgo Palo amarillo." The generic name *Chrysodendron* was proposed at the above reference. It is a synonym of *Mahonia*. As the specific name is much older than the synonymous *Berberis chochoco* Schlecht Bot. Zeitg. xii. 652 (1854), the plant should properly be called **Mahonia tinctoria** (Teran & Berl.), comb. nov. Three varieties of *C. tinctoria* were published, namely *oblongifolia*, *latifolia*, and *longifolia*. Authentic material in the Gray Herbarium, however, shows them to be trivial leaf-forms.

JATROPHA CATHARTICA Teran & Berl. Mem. Comision Limites 9 (1832).—"Crescit in locis sterilibus fere totius Tamaulipae, praecipue

ad margines fluvii dicti Rio de las Nuecas et prope Matamoros urbem." = *Jatropha Berlandieri* Torr. Bot. Mex. Bound. 198 (1858).

Mimosa pseudo-Echinus Teran & Berl. Mem. Comision Limites 11 (1832); Berl. Icon. Ined. no. 1, pt. 2, t. 7.—"Habitat in sylvis provinciarum internarum Orientalium prope San Luis Potosi ad ripam fluminis dicti Rio Grande usque ad Texas. Habitus Echini mollis." = PROSOPIS JULIFLORA (Sw.) DC. Prodr. ii. 447 (1825). It is evident that the specific name was meant to be "*pseudo-Schinus*" and it is so spelled on herbarium specimens. In the brochure and in the unpublished plates, however, it is spelled as given above. Standley, Contr. U. S. Nat. Herb. xxiii. 353 (1922), has commented on the spelling of the specific name.

Calia erythrosperma Teran & Berl. Mem. Comision Limites 13 (1832).—"Habitat in Texas, prope S. Antonio de Bejar urbem, in Tamaulipas inter Palmillas et Jaumave locis ruderatis." *Calia* was described as a new genus. It is, however, much later than the homonymous and universally recognized genus of the *Compositae*. The species is clearly a synonym of SOPHORA SECUNDIFLORA (Ortega) Lag. in DC. Cat. Hort. Monspl. 148 (1813).

Lantana rubra Berl. in Teran & Berl. Mem. Comision Limites 15 (1832); Berl. Icon. Ined. no. 1, pt. 1, t. 5, fig. 1.—"Habitat in Tamaulipas circa Matamoros urbem, in Tejas ad ripam maris, in loco dicto Bahia de Matagorda et prope San Antonio de Bejar urbem." This is a synonym of either L. CAMARA L. or L. HORRIDA HBK.

4. ON THE VALIDITY OF MOLINA'S SCIENTIFIC NAMES.

In the most recent addition to his list of critical papers on the flora of the Argentine, Professor Lucien Hauman, Physis vii. 67-76 (1923), has reviewed and discussed the validity of the plant-names proposed by Molina in thefirst (1782) edition of the "Saggio sulla storia naturale del Chili." It is surprising that Professor Hauman, admitting the priority of many of Molina's names, has refused to accept the necessary name-changes, considering the names published in the Saggio to be "nomina nuda" because they are more frequently identifiable by items of folk-lore or by philological or pharmaceutical details mentioned by Molina, than by the formal latin diagnoses. It must be admitted that Molina's botanical descriptions are very brief and are frequently inaccurate. The descriptions, however, are always accompanied by a discussion in the text of the Saggio relative to the habit and to the native names and uses of the plant treated. Such discussion, supplementing the poorly prepared technical matter,

commonly serves to identify the species positively. In the brevity of his descriptions Molina was not at all exceptional in his age, and his names are about as readily identified from their diagnoses as are the species described by Linneus in the "Systema Naturae." If we are to accept the principle upon which Professor Hauman rejects Molina's names, treating all species as nomina nuda which are unidentifiable from their original description alone, and refusing to admit any *a posteriori* evidence as to the identity of such species, then botanical nomenclature is destined to a highly undesirable and catyclismic reorganization, since most of the early species and even a goodly proportion of the recent ones, are more readily, if not exclusively, identifiable from some locality, use, or local-name mentioned, or from a study of the original material, than they are from the whole of the formal portion of the description. Consistency, therefore, demands that we accept Molina's names when they are satisfactorily identified, as most of them have been through the efforts of Philippi, Anal. Univ. Chile xxii. 699–741 (1863). It is also to be noted that most of Molina's names were considered sufficiently well identified to be cited in the synonymy of Reiche's Flora de Chile. When the identity of such names has been determined with accuracy sufficient to warrant citing them, unquestioned, in synonymy, it would seem that we are logically obliged, if our acceptance of priority be more than a pretense, to take them up if they fulfill in other respects the necessary nomenclatorial requirements. Although Molina's names were disregarded in the past, their neglect was not from their inadequate definition, but because the earlier workers on the flora of southern South America followed, more or less closely, the principle finally formulated as the "Kew Rule" which calls for the acceptance, not of the oldest specific name, but of the first specific name under the accepted generic name. While it is regrettable that well known specific names should be displaced by the neglected ones of Molina, there seems no other course for those who find their guide in the modern International Rules of Nomenclature formulated at Vienna, which call for the acceptance of the oldest specific name irrespective of the genus under which it was described. With the exception of the few changes made at this time, most nomenclatorial adjustments occasioned by the priority of Molina's names, have been made by previous writers.

Fitzroya cupressoides (Molina), comb. nov. *Pinus cupressoides* Molina, Sagg. Chile 168 (1782). *Libocedrus cupressoides* Kuntze, Rev. Gen. iii. 375 (1893). *F. patagonica* Hook. f. ex Lindl. Jour. Hort. Soc. vi. 264 (1851).

Frankenia salina (Molina), comb. nov. *Ocymum salinum* Molina, Sagg. Chile 239 (1782). *F. Berteroana* Gay, Fl. Chile i. 247 (1845).

Gomortega keule (Molina), comb. nov. *Lucuma keule* Molina, Sagg. Chile 187 (1782). *G. nitida* R. & P. Syst. Fl. Peruv. i. 108 (1798).

Larrea balsamica (Molina), comb. nov. *Mimosa balsamica* Molina, Sagg. Chile 165 (1782). *L. nitida* Cav. Anal. Hist. Nat. Madrid ii. 120 (1800).

Myrceugenia luma (Molina), comb. nov. *Myrtus luma* Molina, Sagg. Chile 173 (1782). *Myrceugenia apiculata* (DC.) Niedz. in E. & P. Nat. Pflanzenf. iii. Abt. 7, 74 (1893).

Nierembergia minima (Molina), comb. nov. *Nicotiana minima* Molina, Sagg. Chile 153 (1782). *Nierembergia repens* R. & P. Fl. Peruv. ii. 13, t. 123 (1799).

Statice guaicuru (Molina), comb. nov. *Plegorhiza guaicuru* Molina, Sagg. Chile 164 (1782). *S. chilensis* Phil. Anal. Univ. Chile xx. 58 (1861).

PROSOPIS CHILENSIS (Molina) Stuntz, U. S. Bur. Pl. Indust., Invent. xxxi. 85 (1914). *Ceratonia chilensis* Molina, Sagg. Chile 172 (1782). *P. juliflora* (Sw.) DC. Prodr. ii. 447 (1825).—As the above combination was made in an obscure place it is repeated here to call attention to the fact that it is the proper name for the widely distributed, variable, and much named species known as "mesquite" in Mexico and southwestern United States, and generally current as *Prosopis juliflora*. The combination is not given in the Kew Index, nor is ARISTOTELIA CHILENSIS (Molina) Stuntz, l. c. [= *Cornus chilensis* Molina], nor VILLARESIA CHILENSIS (Molina) Stuntz, l. c. xxxii. 39 (1914) [= *Citrus chilensis* Molina].

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

New Series.—No. LXXI

NOTES ON NORTH AMERICAN SCUTELLARIAS

BY C. WILLIAM PENLAND

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NOTES ON NORTH AMERICAN SCUTELLARIAS.

C. William Penland.

(Plates 140, 141.)

Dr. Asa Gray (Proc. Am. Acad. viii. 370), after remarking as to the placing of the genus *Scutellaria* in a subtribe, goes on to state that "The winged nutlets of *Perilomia*, however, are curiously imitated in one or two species of *Scutellaria*, only obscurely so in *S. parvula*, as has been noted by Dr. Torrey, . . . but strikingly in *S. nervosa*, Pursh, and in a Japanese species not otherwise very similar . . . ." The presence of this membranaceous wing, together with a reputed difference in shape of the corolla, is used as a basis of separation of the above-mentioned genus *Perilomia* from *Scutellaria* by Humboldt, Bonpland & Kunth (Nov. Gen. & Sp. Amer. ii. 326). Prof. Fernald (Rhodora, xxiii. 85), after examining sheets of the Old World *S. galericulata* and of the North American form, which for many years had passed as *S. galericulata*, came to the conclusion that the Old World plant is really not found as such on this side of the Atlantic, but that it has a closely related representative here. This was demonstrated chiefly by nutlet-characters, the exact significance of which will be clarified in the sequel.

These facts have combined to indicate that perhaps a critical inspection of the group in question, from the standpoint of the fruit, might serve to throw light on, if not to clear up, some well known taxonomic difficulties existing here. From an examination of over

two thousand sheets of herbarium material, it was found that the nutlet-characters indicated in a striking way the relationships of species and sections within the genus.

At this point it will be convenient to establish the generic and tribal relations of *Scutellaria*. In 1832–36, Bentham (*Labiatarum Genera et Species*) put *Scutellaria* and *Perilomia*—a South American genus—into a single tribe, but later, in 1848 (De Candolle's *Prodromus*), he added *Brunella* and *Cleonia* to these two and threw them into a sub-tribe *Scutellarieae* of the tribe *Stachydeae*. Briquet, in his treatment of the genus in Engler & Prantl's *Die Natürlichen Pflanzenfamilien*, assigns *Scutellaria* and *Salazaria* Torrey to the tribe *Scutellarioideae*, placing *Perilomia* in a separate tribe, *Stachyoideae*. It is noteworthy that in his grouping of the *Perilomia* entities he includes certain forms which other authors have put with *Scutellaria*, e. g., *S. Mociniana* Benth., and which apparently do not differ from that genus except by the alleged upright position of the seed. This special portion of the genus even has the scutellum on the calyx,—a character lacking in other sections. Undoubtedly the position of the seed is important in the classification, but its infallibility is questionable when it separates such apparently closely related forms. It is to be regretted that more material of these forms is not at hand. It is thought that the presence of the scutellum might serve as a more reliable generic character.

Scutellaria then, is characterized by its bilabiate calyx, with lips entire and closed in fruit. From the upper lip is a projection known as the scutellum. Its co-genus *Salazaria* is set off on account of its calyx which becomes swollen in fruit.

As somewhat detailed accounts of the genus, we have the earlier work of Arthur Hamilton, "Monographie du Genre Scutellaire," Bulletin Seringe, 1832, and Bentham's treatise in the work above mentioned. Both these earlier writers have seen fit to make a number of sections, separated according to the nature of the inflorescence, Bentham confessing on his part the inadequacy of these characters. Hamilton makes but three sections and includes in them fifty-two species, fourteen of which are assigned to North America. Bentham makes five sections into which sixty-three species are placed, fifteen of which are North American. Inasmuch as in the present investigation the fruit has been specially studied, and since the Old World specimens available were too infrequently fruiting for accurate observation and too scarce for authoritative judgment, it was thought

best to confine attention to North American material, exclusive of Mexico.

Interestingly enough, the sections earlier adopted in classification are, with a few exceptions, confirmed by the reproductive characters. Briquet, following the work of Gray, was evidently the first to expand on the more conservative, and therefore more reliable reproductive characters, to indicate taxonomically the natural relationships. The presence or absence of a membranaceous wing does not establish

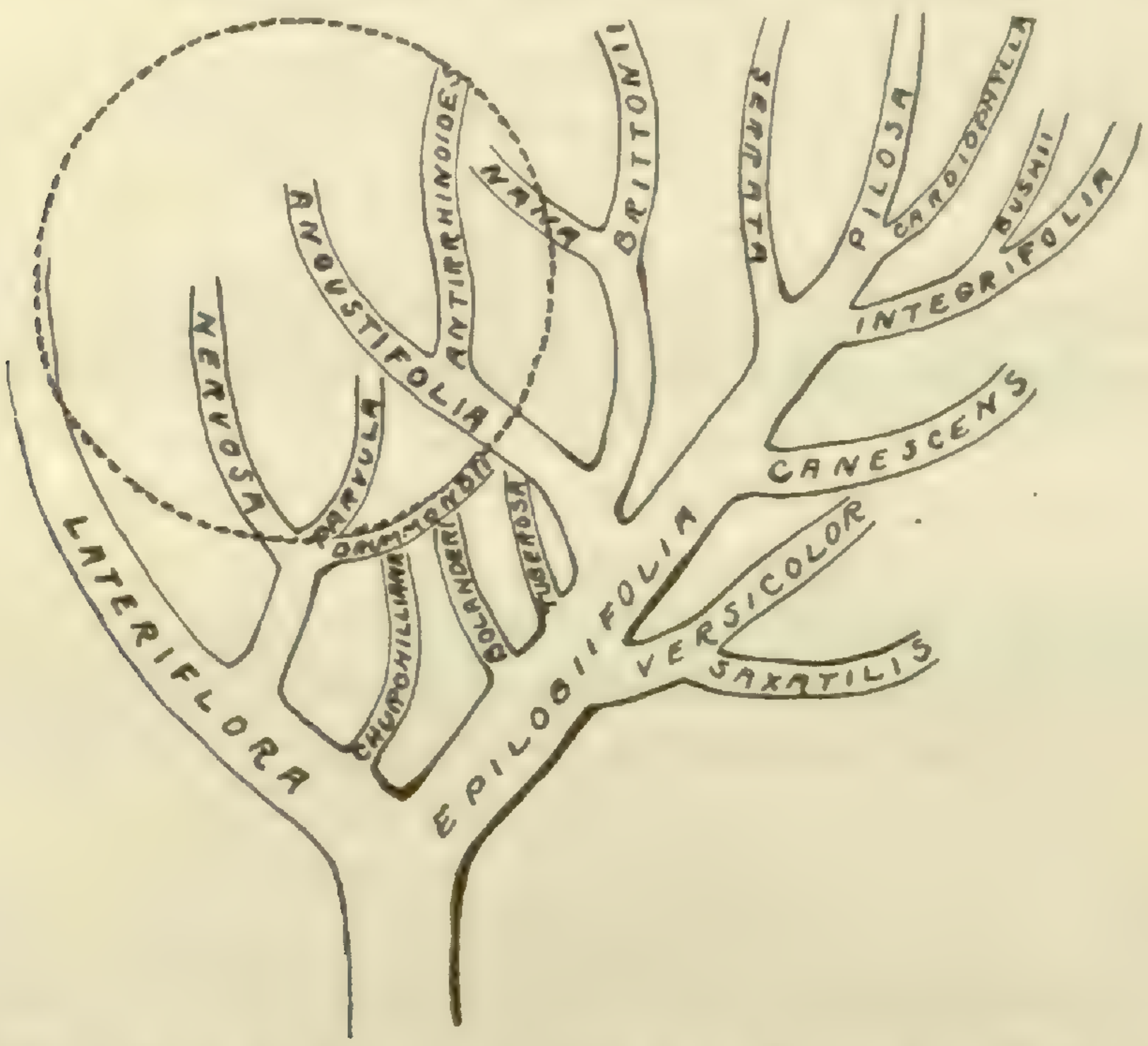


Diagram 1. Showing relation of species of Scutellaria. (Forms with winged nutlets are in the circle.)

generic differences, as indicated by Bentham, for at least three well defined American species of the genus have this wing. It is also well to remark here that the two sheets referred to *Perilomia* (*P. ocymoides*) which are found in the Gray Herbarium do not have the winged achenia attributed to the genus. Apparently, therefore, we have double evidence as justification for the discard of this character as a generic distinction. However, the membranaceous wing is important within the genus *Scutellaria* and might afford a basis for the first division into component parts in an artificial key.

It is believed that even this nutlet-character is artificial, since it apparently has been secondarily acquired, appearing as it does in several different groups. It seems beyond a doubt, that *Scutellaria*

lateriflora and *S. epilobiifolia* are nearest the ancestral branch of the phylogenetic tree (diagram 1). Both are very wide-spread in distribution. According to the diagram, as I have conceived the situation, they represent the first forks of the tree, and both have given rise to groups showing the character in question. Further, in a hasty review of nutlet-characters of the other genera of the *Labiatae*, it appears that the character referred to is absent. This is another justification for believing it is of more recent development.

The first division was taken up by Gray, later adopted by Briquet and is now in use by authors of the larger manuals in this country. Briquet introduced names for these divisions or sections. The section *Scutellariopsis* should be extended to include at least two more North American species. Hitherto *Scutellaria nervosa* has been classed as our sole representative of this group. Yet it is difficult to understand why *S. parvula*, the achene of which has a conspicuous band, amazing in its constancy, should be left out. Here too we should place the *S. angustifolia* group, one species of which has nutlets with wings rivaling even those of *S. nervosa*.

The present status of the work and the limited area covered do not justify the grouping of the species of the genus into sections. It is hoped that later a survey of the world representatives may be made, at which time such sectional characters may be properly adjudged. It is hoped also, that a study of the immediately related genera may be taken up, following the more critical reproductive characters.

The arrangement of species given below follows a more or less natural system. As arranged, numbers 1, 2 and 3; 4 and 5; 6, 7, 8, 9, 10 and 11; 12, 13, and 14; and 15, 16, 17, 18, 19, 20 and 21, form fairly well defined groups. It will be seen that they do not agree with treatments given by other students of the group. The fact that militates against this kind of grouping, of course, is that it indicates an impossible linear evolution. True relationships are better shown in the tree (diagram 1).

There remains to say a word or two upon the acceptance of nutlet-characters as a basis for the separation of sections. This can best be brought out by means of an example: Perhaps one of the best-marked groups of species, the interrelations of which are shown by nutlet-characters, is the series consisting of *S. lateriflora*, *S. galericulata* and *S. epilobiifolia*. All three have canary-yellow achenes which are not duplicated elsewhere in the genus. Of these three *S. galericulata* (I am using this Old World species for purposes of illustra-

tion) comes between the others, both from a superficial standpoint and from the characters of the nutlets. *S. lateriflora* has small papillae or wart-like protuberances on the surface of the achene, while *S. epilobiifolia* has the surface of the achene merely scabridulous. The European *S. galericulata* has nutlets closely resembling those of *S. lateriflora*, while the vegetative characters are very similar to those of *S. epilobiifolia*. The corolla of the latter exceeds by about 1 cm. that of *S. galericulata*, which attains a length of no more than 1.5 cm. From this comparative examination, based on reproductive characters, it would seem anything but following the natural system to break off *S. lateriflora* and put it into a separate section as both Bentham and Briquet have done.

I desire to record my thanks to Prof. M. L. Fernald, who has supervised this work and given invaluable advice; to Dr. B. L. Robinson, Dr. J. M. Greenman, and Mr. Bayard Long, for the loan of herbarium material of their respective institutions; to Miss Mary A. Day and other members of the Gray Herbarium staff for help rendered along various lines during the execution of the work.

The key, based upon nutlet-characters, is artificial, since, as already explained, species which seem to have come through different lines of descent are thrown together. In the citation of specimens all which are not in the Gray Herbarium are indicated by initials in parentheses: N, Herbarium of New England Botanical Club; M, Missouri Botanical Garden; P, Academy of Natural Sciences of Philadelphia.

Analytic Key based on Nutlet-Characters.[1]

A. Nutlets banded or winged, or conspicuously compressed dorso-ventrally B.
  B. Nutlets conspicuously winged C.
    C. Nutlets not over 1 mm. in diameter; wing more or less median D.
      D. Nutlets with muriculate papillae; wing relatively wide 7. *S. nervosa*.
      D. Nutlets with bluntish papillae: wing relatively narrow 6. *S. parvula*.
    C. Nutlets mostly over 1 mm. in diameter: wing somewhat basal, giving the nutlet a flattened appearance E.
      E. Nutlets with relatively narrow, unexpanded and non-membranaceous wings ..... 8. *S. angustifolia*.
      E. Nutlets with very wide, membranaceous wings. 9. *S. antirrhinoides*.
  B. Nutlets mostly merely compressed, never with conspicuous wings I.
    I. Nutlets dull yellow or grayish, with somewhat conical papillae ..... 11. *S. nana*.

[1] In the absence of mature nutlets some species have to be omitted from this key. Though in the succeeding descriptions they are placed in what appears to be their natural sequence.

I. Nutlets dull black, with somewhat tuberculate, flattish papillae.....10. *S. Brittonii.*
A. Nutlets not winged except rarely and in immature condition J.
J. Nutlets merely rugose or finely granulate-papillate K.
K. Nutlets canary yellow L.
L. Nutlets merely scabridulous, *i. e.*, with inconspicuous papillae.....1. *S. epilobiifolia.*
L. Nutlets with minute, wart-like papillae.....3. *S. lateriflora.*
K. Nutlets black or brown, finely granulate-papillate....12. *S. resinosa.*
J. Nutlets with conspicuous papillae M.
M. Nutlets yellowish or orange.....4. *S. Bolanderi.*
M. Nutlets brown or black N.
N. Nutlets with conical, more or less sharp-pointed papillae O.
O. Nutlets with very slender elongate papillae....21. *S. saxatilis.*
O. Nutlets with the papillae short, broad at base, abruptly pointed.....20. *S. versicolor.*
(Note: *S. versicolor* frequently has the nutlets orange.)
N. Nutlets with tuberous, flattened, obtuse papillae P.
P. Nutlets strikingly rosulate in appearance....16. *S. integrifolia.*
P. Nutlets not conspicuously rosulate Q.
Q. Nutlets with thin, laminate papillae.....13. *S. Drummondii.*
Q. Nutlets with thick papillae R.
R. Nutlets with irregularly disposed muriculate papillae.....5. *S. tuberosa.*
R. Nutlets with papillae regularly disposed S.
S. Nutlets about 2 mm. in diameter.....19. *S. serrata.*
S. Nutlets 1–1.5 mm. in diameter.....15. *S. pilosa.*
J. Nutlets with short, truncate papillae T.
T. Nutlets black.....14. *S. cardiophylla.*
T. Nutlets brownish U.
U. Nutlets with processes flat on top, frequently with median depression.....18. *S. canescens.*
U. Nutlets with papillae rounded on top, smooth....17. *S. Bushii.*
(Note: *S. canescens* might be looked for here; the nutlets are light brown or olive-green in color.)

1. S. EPILOBIIFOLIA Hamilton. Fig. 6. Stem simple or branched, erect, 1.5–8 dm. high, smooth or somewhat pubescent: leaves ovate or oblong-lanceolate, acuminate, sessile or subsessile, serrate, frequently purplish underneath, 1.5–6 cm. long; the upper gradually diminishing into the bracts: flowers solitary in the axils of the upper leaves; corolla with pale tube and violet-blue lips and galea, rarely pink or white, 1.5–2.5 cm. long; lower lip somewhat protruding: achenes yellow, merely scabridulous or slightly pebbled, about 1.5 mm. in diameter.—Monog. 32 (1832). *S. galericulata* of American authors, not L.—Newfoundland to British Columbia and southward to Arizona. The following specimens are representative. Newfoundland: *M. L. Fernald & K. M. Wiegand*, nos. 3930, 3929 and 6107; *B. L. Robinson & H. von Schrenk*, no. 103. Quebec: *H. St. John*, no. 90694; *J. Macoun*, no. 68667. Nova Scotia: *C. D. Howe & W. F. Lang*, no. 529; *M. L. Fernald & B. Long*, no. 22363. New Hampshire: *C. C. Stewart*, no. 4403. Massachusetts: *J. M. Greenman*, no. 2079. New York: *O. P. Phelps*, no. 805. Ontario: *J. Macoun*, no. 20850. Michigan: *J. H. Ehlers*, no. 125. Indiana:

O. E. Lansing, no. 2829. MINNESOTA: *M. A. Barber*, no. 7. SOUTH DAKOTA: *P. A. Rydberg*, no. 948. NEBRASKA: *P. A. Rydberg*, no. 1490. ASSINIBOIA: *J. Macoun*, no. 5848. MONTANA: *F. L. Scribner*, no. 216. WYOMING: *A. Nelson & E. Nelson*, no. 6558. UTAH: *S. Watson*, no. 835. ARIZONA: *J. T. Rothrock*, no. 245. CALIFORNIA: *C. F. Sonne*, no. 287 (P). OREGON: *W. C. Cusick*, no. 1939a. BRITISH COLUMBIA: *S. Brown*, no. 748.

Forma ROSEA (Rand & Redfield) Fernald, RHODORA xxiii. 86 (1921). *S. galericulata*, forma *rosea* Rand & Redfield, Fl. Mt. Desert, 137 (1894).

Forma ALBIFLORA (Millsp.) Fernald, l. c. (1921). *S. galericulata*, forma *albiflora* Millsp. Fl. W. Va. 428 (1892).

2. S. CHURCHILLIANA Fernald. A form intermediate between *S. lateriflora* and *S. epilobiifolia* and possibly a hybrid of these two: stems erect, branching, flexuous, the angles covered with minute ascending pubescence: flowers borne singly in the axils of the upper leaves or in axillary racemes, similar to those of *S. lateriflora*: corolla violet-blue, 1–1.5 cm. long: leaves thin, ovate, acuminate, short-petioled.—RHODORA iv. 137 (1902).—Gravelly river-thickets of Maine and adjacent New Brunswick. The following specimens are characteristic. MAINE: *M. L. Fernald & B. Long*, nos. 14455 (P), 14452, 14454 and 260; *M. L. Fernald*, no. 2088; *W. W. Eggleston & M. L. Fernald*, Valley of St. Francis River, August 12, 1902; *M. L. Fernald*, Valley of Aroostook River, September 8, 1897; *K. K. Mackenzie*, no. 3590 (M); *O. W. Knight*, Veazie, August 6, 1905, and no. 100; *J. A. Cushman*, no. 2134 (N); *J. R. Churchill*, Fort Kent, July 19, 1908 (N); *Kate Furbish*, East Livermore, July & August 1896 (N), South Poland, 1893 (N), Great Diamond Island, 1888 (N), Great Chebeague Island, June 11, 1902. NEW BRUNSWICK: *M. L. Fernald & B. Long*, no. 14453.

3. S. LATERIFLORA L. FIG. 7. Erect, mostly branched, 2–6 dm. high, smooth: leaves thin, oblong-lanceolate, acuminate, serrate, rounded at the base, petioled, 3–9 cm. long: inflorescence in axillary, rarely terminal, racemes: corolla bluish to whitish, 5–8 mm. long; lips equal in length: achenes yellow, with minute papillae on the surface.—Sp. Pl. ii. 598 (1753).—River-thickets or wet shaded places, from Newfoundland to British Columbia and southward to Florida and New Mexico. The following are representative. NEWFOUNDLAND: *M. L. Fernald & K. M. Wiegand*, no. 6102. QUEBEC: *S. F. Blake*, no. 5619; *M. L. Fernald & H. B. Jackson*, no. 12152. PRINCE EDWARD ISLAND: *M. L. Fernald, B. Long & H. St. John*, no. 7960. NOVA SCOTIA: *H. St. John*, no. 1443. MASSACHUSETTS: *B. L. Robinson*, no. 588. NEW JERSEY: *Gershoy*, no 589. PENNSYLVANIA: *A. A. Heller & E. G. Heller*, no. 653. WEST VIRGINIA: *J. M. Greenman*, no. 480. ONTARIO: *J. Macoun*, no. 21859. OHIO: *J. M. Greenman*, no. 1399. ILLINOIS: *Chase* (P), no. 514177. MISSISSIPPI: *S. M. Tracy*, no. 8752. MISSOURI: *E. J. Palmer*, no. 2651. NEBRASKA: *F. Clements*, no. 2781. NEW MEXICO: *C. Wright*, no. 1538.

Oregon: *J. C. Nelson*, no. 1832. Washington: *W. N. Suksdorf*, no. 1001. British Columbia: *J. Macoun*, no. 54677.

Forma rhodantha Fernald, Rhodora xxiii. 86 (1921). A form with pinkish flowers, found in Quebec.

Forma albiflora (Farwell) Fernald, Rhodora xxiii. 86 (1921). *S. lateriflora* var. *albiflora* Farwell, Mich. Acad. Sci. Ann. Rep. xix. 249 (1917). A form with white flowers.

4. S. Bolanderi Gray. Erect, tall and very slender, virgulate or branched from below, 1.5–5.5 dm. high, leafy, pubescent or short-hairy: leaves broadly obovate, obtuse, sessile, crenate, or the upper nearly entire; corolla nearly as in *S. antirrhinoides*, but white or creamy in color and dilated at the throat, 10–15 mm. long; lips subequal: nutlets yellowish, with slender papillae.—Proc. Am. Acad. vii. 387 (1867). —River-bottoms, etc., in California from Plumas County southward.[1] The following are characteristic. *H. M. Hall*, no. 696 (M); *G. Hansen*, no. 448 (M); *C. R. Orcutt*, no. 429 (M); *A. Eastwood*, no. 4199.

Var. **californica** (Gray), n. comb. Differs from the above in being very finely puberulent, somewhat more rigid; all but sometimes the lowest pairs of leaves entire, petioled; the corolla mostly white, sometimes tinged with blue, 15–18 mm. long.—*S. californica* Gray, Syn. Fl. ii. 381 (1878). Including *S. viarum* Heller, Muhlenbergia, i. 32 (1904).—In California from Amador County northward to Tehama County. The following represent the variety. *J. D. Hooker & A. Gray*, Calaveras County, 1877; *A. A. Heller*, nos. 5786, 7020, 12379; *E. Braunton*, no. 1047 (M); *T. Bridges*, no. 304; *J. Torrey*, no. 406; *C. F. Sonne*, no. 286 (M); *A. Eastwood*, no. 1530; *M. E. Jones*, no. 13485 (M); *J. P. Tracy*, no. 2297.

This variety includes a number of forms intermediate between *S. Bolanderi* and *S. antirrhinoides*. In fact it might well be regarded as a hybrid of these two. In the main it has more of the characters of the former than of the latter and hence is referred here rather than to *S. antirrhinoides* as at first done by Gray. Fruiting material is too poorly represented for good comparison.

5. S. tuberosa Benth. Fig. 12. Mostly simple and erect, frequently with many leafy stems from a common base, or even decumbent, villous to nearly glabrous, 2.5–15 cm. high, or, when trailing, up to 3.5 dm. long: leaves villous or nearly glabrous, petioled, broadly ovate, with few coarse crenations; base rounded, truncate or sometimes cuneate: flowers short-pedicelled, solitary in the upper axils: corolla dark-blue or purple, rarely curved, 1–2 cm. long; the lips subequal: calyx villous: nutlets with projections somewhat muriculate, dark-brown when fully mature.—Lab. Gen. et Sp. 441 (1832–1836).—Foothills or valleys throughout California and southern Oregon. The following specimens are representative. California: *W. H.*

[1] One sheet is from Indian Valley, Plumas County, *J. G. Lemmon*, autumn, 1886; the rest from Amador Co. southward.

Brewer, no. 357; *C. C. Parry*, no. 338; *W. W. Jones*, no. 285; *J. G. Lemmon*, no. 338; *A. A. Heller*, no. 7288; *C. R. Orcutt*, no. 1343 (M). OREGON: *H. S. Prescott*, Grants Pass, April 5, 1912; *T. Howell*, no. 1252 (M); *E. W. Hammond*, no. 329 (M).

6. S. PARVULA Michx. FIG. 2. Erect, simple or branching, 1–3.5 dm. high, usually many-stemmed from a moniliform tuberiferous base, pubescent nearly throughout: leaves thin, greenish, oblong-ovate, much broader at the base, 0.8 to 2 cm. long, prominently nerved beneath; the upper sessile; the lower short-petioled, occasionally with few coarse teeth: flowers solitary in the upper axils: corolla 0.7–1 cm. long, blue; the lower lip longer and flaring: calyx with upper lip commonly purple: nutlets papillose with tubercles, banded, showing close relation with *S. nervosa*.—Fl. ii. 11 (1803). *S. campestris* Britton, Mem. Torr. Club, v. 283 (1894). *S. parvula*, var. *mollis* Gray, Syn. Fl. ii. 380 (1878), in part.—On richer soils of the Great Lake region and the Mississippi valley, Quebec and Ontario southward to Georgia and Texas. The following are characteristic. QUEBEC: *W. F. Macrae*, "in river St. Lawrence opposite Montreal" (M); *A. S. Pease*, no. 12940; *Mrs. Shepard*. ONTARIO: *J. Macoun*, Pelee Point, Lake Erie, August 6, 1901. MICHIGAN: ex. Herb. *E. F. Smith*, Ionia, 1877. VERMONT: *L. R. Jones & W. W. Eggleston*, Burlington, July 12, 1894. NEW YORK: *A. Wood*, Dexter. OHIO: *E. L. Moseley*, Marblehead, May 25, 1895. ILLINOIS: *H. M. Smith*, no. 5924; *A. S. Pease*, no. 12555; *J. M. Greenman*, no. 2614 (M). TENNESSEE: *E. J. Palmer*, no. 17333 (M); *S. M. Bain*, no. 38. VIRGINIA: *J. Q. A. Fritchey*, Richmond, August 28, 1888. GEORGIA: *T. J. Wray*, Augusta (P); *S. Boykin* (P). MISSOURI: *O. E. Lansing*, no. 3033; *J. Davis*, no. 3434 (M); *E. J. Palmer*, no. 5632 (M). TEXAS: *E. J. Palmer*, no. 5034 (M); *J. Reverchon*, no. 3245 (M). LOUISIANA: *E. J. Palmer*, no. 7217 (M). OKLAHOMA: *E. J. Palmer*, no. 5956 (M); *H. W. Houghton*, no. 3582½. ARKANSAS: *B. F. Bush*, no. 1435 (M).

Var. AMBIGUA (Nutt.) Fernald. Similar to above but slightly more rigid in aspect; stem and under surface of leaves usually purplish, glabrous or with very slight appressed puberulence; the upper surface of the leaves sometimes with spreading hairs; the leaves narrower and rarely toothed.—RHODORA iii. 201 (1901). *S. ambigua* Nutt. Gen. ii. 37 (1818). *S. parvula*, authors.—In drier habitats, Maine to Minnesota and southward to Texas and westward to Nebraska. The following are characteristic. MAINE: *M. L. Fernald*, no. 466; *J. C. Parlin*, no. 305. CONNECTICUT: *G. Thurber*, East Haven, 1855; *E. B. Harger*, no. 6411 (P). PENNSYLVANIA: *W. F. Detwiller*, Mercersburg, May 19, 1845 (P); *S. D. Ingram*, Harrisburg (P). NEW JERSEY: *P. Dowell*, no. 6027. DELAWARE: *W. M. Canby*, Rehoboth, July, 1878 (P). INDIANA: *A. H. Young*, Lafayette, June, 1879 (P). TENNESSEE: *A. Ruth*, Knoxville, June, 1897 (P). ILLINOIS: *S. B. Mead*, Augusta, 1845 (P); *H. N. Patterson*, Oquawka, August, 1873; *H. A. Gleason*, Rantoul, July 5, 1907. MISSOURI: *B. F. Bush* no. 336; *O. E. Lansing*, no. 2977. LOUISIANA: *J. Hale*, Alexandria

(P). Texas: *E. Hall*, no. 453 (M). Oklahoma: *G. W. Stevens*, no. 2235. Iowa: *R. Coombs & C. R. Ball*, no. 569 (M). Kansas: *J. B. Norton*, no. 411 (M). Nebraska: *H. J. Weber*, Lincoln, June, 1890 (M). South Dakota: *H. O. Powell*, White Rock, June, 1902. Minnesota: *E. P. Sheldon*, Princeton, July, 1892.

7. S. nervosa Pursh. Fig. 1. Very slender, mostly simple, but frequently branched, 1.5 dm. high: internodes separating widely the opposite pairs or leaves: leaves ovate or oblanceolate, toothed, smooth, but occasionally sparsely strigose on the upper surface, 2–4.5 cm. long; the lower short-petioled; the upper sessile: flowers solitary in the axils of the entire upper leaves: corolla bluish, about 1 cm. long; the lower lip protruding beyond the upper: nutlets winged, yellowish or buff, with muriculate papillae.—Fl. ii. 412 (1814). *S. gracilis* Nutt. Gen. ii. 37 (1818).—Pennsylvania to Virginia, westward and southward to Missouri and Alabama. The following specimens are representative. Pennsylvania: *E. B. Bartram*, Homewood near Pillsbury, June 15, 1907 (P); *S. Brown*, Quakertown, June 3, 1894 (P); *A. A. Heller*, Lancaster, May 28, 1889. New Jersey: *J. Torrey*. Delaware: *W. M. Canby*, June 12, 1897 (P). Maryland: *E. B. Bartram*, Conowingo, May 30, 1907 (P). Virginia: *C. S. Williamson*, Great Falls of Potomac, May 28, 1909 (P). West Virginia: *W. M. Pollock*, May 30, 1896. Kentucky: *S. F. Price*, Bowling Green, May 12, 1900 (M); *E. J. Palmer*, no. 17803 (M). Tennessee: *E. J. Palmer*, no. 17601 (M); *A. Ruth*, Knox Co., May, 1893 (M). Alabama: *H. Eggert*, Etowah Co., June 30, 1897 (M). Missouri: *B. F. Bush*, Dunklin Co., May 22, 1892 (M); *H. Eggert*, St. Louis Co., June 5, 1877 (M); *S. B. Mead*, May 30, 1848 (M); *E. J. Palmer*, no. 15585; *E. Hall*, no. 11397 (M). Indiana: *A. H. Young*, Hanover, August, 1881 (P). Ohio: *W. S. Sullivant*, 1840 (P); *E. L. Moseley*, Florence, August 7, 1897.

Forma **ternata**, n. f., foliis ternatis.—One sheet collected by *C. W. Short* at Lexington, Kentucky, 1835 (P).

8. S. angustifolia Pursh. Fig. 3. Erect, stems many from the base, or branched above, or frequently solitary, 1–2 dm. high, minutely pubescent or almost glabrous, from a moniliform tuberiferous or somewhat fibrous base, purplish below: leaves linear to oblong-ovate, obtuse, practically sessile, commonly conduplicate, entire, 1–3 cm. long, except the lower; these when present, petioled, few-toothed, cordate, small, commonly purplish below: flowers in the upper axils, on pedicels 5–8 mm. long: corolla curved at the slender base, commonly 2–2.5 cm. long but reaching 3 cm., not broadening until 5–10 mm. above the calyx: lips subequal or the lower slightly longer, various as to color, deep blue to purple: nutlets large, with slender papillae and faintly banded at the base.—Fl. ii. 412 (1814). Including *S. Austineae* Eastw., Bull. Torr. Bot. Club, xxx. 493 (1903) and *S. linearifolia* Eastw., l. c. 493 (1903).—Stream-bars or on rocky hillsides from British Columbia and Idaho to southern California. The following are representative. Idaho: *W. Trelease*, no. 4883

(M); *A. A. & E. G. Heller*, no. 3150 (P); *J. H. Sandberg*, no. 8689 (M); *J. B. Leiberg*, no. 1548; *J. F. Macbride*, no. 104. BRITISH COLUMBIA: *J. M. Macoun*, no. 67887. WASHINGTON: *F. O. Kreager*, no. 10; *C. V. Piper*, nos. 1570, 1571; *A. D. E. Elmer*, no. 900; *R. M. Horner*, no. R178B411. OREGON: *E. W. Hammond*, no. 330 (M); *W. C. Cusick*, nos. 75, 2145; *M. Spalding*, April 28; *E. P. Sheldon*, no. 8007. CALIFORNIA: *Culbertson*, no. 4446; *C. C. Parry & J. G. Lemmon*, no. 337; *A. Gray*, Chico (field), February to May, 1885; *C. A. Purpus*, no. 5605 (M); *S. B. Parish*, no. 3122 (M); *L. Abrams*, no. 2778; *H. M. Hall & H. P. Chandler*, no. 242; *A. A. Heller*, no. 7889; *A. Eastwood*, no. 1015.

Var. **canescens** Gray. In many respects similar to the above, mostly simple, virgulate, canescent; leaves linear-oblanceolate, 2–4.5 cm. long, nearly tomentose, firm, not conduplicate, ascending sharply; corolla slender and gracefully curved.—Bot. Calif. i. 603 (1876). *S. siphocampyloides* Vatke, Bot. Zeit. xxx. 717 (1872).—In CALIFORNIA from Sierra County southward on foot-hills and mountains. The following are representative. *H. N. Bolander*, nos. 4946 (M), 3947; *W. R. Dudley*, no. 4131; *A. D. E. Elmer*, no. 4434 (M); *W. H. Brewer*, no. 1285.

9. S. ANTIRRHINOIDES Benth. FIG. 4. Mostly erect, somewhat spindling, simple or branched, from a chiefly fibrous base, 1–3.5 dm. high, minutely pubescent: leaves ovate-oblong, obtuse, mostly short-petioled, never over 2.5 cm. long; all but the very lowest entire: flowers in the upper axils, on pedicels 5–10 mm. long, commonly 1–1.5 cm., never over 2 cm. long; the corolla-tube flaring from immediately above the calyx; the lower lip usually longer, deep blue to violet in color: nutlets with slender papillae, frequently strikingly winged, suggesting those of *S. parvula* and *S. nervosa*.—Bot. Reg. viii. 1493 (1822). *S. sanhedrensis* Heller, Muhlenbergia, i. 31, (1904). *S. nevadensis* Eastwood, Bull. Torr. Bot. Club, xxx. 492 (1903).—Rocky banks and slopes, Idaho and Utah to California and Oregon. The following are characteristic. IDAHO: *J. F. Macbride*, nos. 937 (M), 482 (M); *A. Nelson & J. F. Macbride*, no. 1208. UTAH: *L. H. Pammel & R. E. Blackwood*, no. 3778. NEVADA: *A. A. Heller*, no. 11120; *M. E. Jones*, no. 4036; *A. Nelson & J F. Macbride*, no. 1927. CALIFORNIA: *A. A. Heller & P. B. Kennedy*, nos. 8798, 8843 (M); *J. P. Tracy*, no. 3399; *L. E. Smith*, no. 316. *A. A. Heller*, nos. 5894, 12111. OREGON: *E. Hall*, no. 398; *J. C. Nelson*, no. 2668; *T. Howell*, no. 1253 (M).

10. S. BRITTONII Porter. Erect, simple or branched, minutely pubescent or puberulent, usually 1–2 dm. high: underground stems frequently with moniliform tubers: leaves obovate, acuminate at each end or obtuse at tip, somewhat viscid, sometimes purplish beneath, 1.5–3 cm. long, hardly petioled; margins subrevolute; nerves prominent dorsally: corolla slender at base, gradually dilated to ampliate throat and lips, blue, 2–3 cm. long: nutlets dull black, mostly angled with tuberculate processes.—Bull. Torr. Bot. Club, xxi.

177 (1894). *S. resinosa* of Gray, not Torrey.—On foot-hills or plains in northern Colorado and southern Wyoming. The following specimens are representative. Colorado: *G. E. Osterhout*, no. 2587 (P); *H. N. Patterson*, no. 296; *C. C. Parry*, no. 85 (P); *T. S. Brandegee*, no. B 413 (P); *E. B. Payson*, Eldora, July 7, 1919. Wyoming: *A. Nelson*, nos. 94 and 7009.

11. S. nana Gray. Fig. 5. Small, usually 4–6 cm. high, cinereous-puberulent, several branches from the base: rootstocks yellow, with moniliform tubers or simply tuberiferous: leaves entire, ovate to obovate, with long attenuate base, or sometimes spatulate, 1–2 cm. long; nerves usually conspicuous on the lower surface of the leaf: corolla white, the lips equal: nutlets dull yellow with conical protuberances, sometimes angled or compressed.—Proc. Am. Acad. xi. 100 (1876). *S. Footeana* A. I. Mulford, Bot. Gaz. xix. 118 (1894).—Dry sandy hillsides in northwestern Nevada, northern California, southern Oregon, and southwestern Nevada. The following are representative. California: *L. E. Smith*, no. 390; *A. A. Heller*, no. 8086; *H. E. Brown*, no. 613; *E. Palmer*, no. 2602 (P). Nevada: *J. G. Lemmon*, no. 538; *M. E. Jones*, Wadsworth, June 16, 1897 (M); *P. B. Kennedy*, no. 1028 (M). Oregon: *M. E. Peck*, no. 6747; *J. B. Leiberg*, no. 472; *W. C. Cusick*, no. 1980. Idaho: *A. I. Mulford*, Black Cañon, June 18, 1802.

12. S. resinosa Torr. Fig. 8. Stems erect, few to many, from a woody base, 1–3 dm. high, puberulent: leaves ovate, entire, or the lower subcrenulate, attenuate at the base, slightly petioled or sessile, minutely pubescent, resiniferous, 1–2 cm. long; nerves prominent on the upper surface of the leaves: corolla bluish to violet, 12–20 mm. long; upper lip forming an arch with the tube; lower lip occasionally lightly blotched, equal to or exceeding the upper: nutlets about 1 mm. in diameter, black, minutely granular.—Ann. Lyc. N. Y. ii. 232 (1826). *S. Wrightii* Gray, Proc. Am. Acad. viii. 370 (1872).—Kansas to Texas and westward to Arizona, on dry grassy slopes or prairies. The following sheets are representative. Kansas: *J. M. Bates*, no. 4552; *C. L. Shear*, no. 72; *A. S. Hitchcock*, no. 410; *E. Bartholomew*, June 6, 1889 (M). Oklahoma: *R. L. Clifton*, no. 3025; *G. W. Stevens*, no. 1291; *P. J. White*, no. 28 (M); *W. H. Emig*, no. 776 (M). Texas: *E. Hall*, no. 457; *E. Palmer*, no. 1086-7; *A. A. Heller*, no. 1606; *F. Lindheimer*, no. 674; *E. J. Palmer*, nos. 14117 (M) 11563 (M), 13738 (M), 10229 (M). New Mexico: *G. Thurber*, no. 286; *C. Wright*, no. 1540; *O. B. Metcalfe*, no. 934; *A. Gordon*, no. 67 (M). Arizona: *L. N. Goodding*, nos. 848, 224 (M); *J. G. Lemmon*, no. 2860; *D. Griffiths*, no. 4809; *C. G. Pringle*, no. 15956.

Var. **brevifolia** (Gray), n. comb. Stems from a ligneous base, mostly over 2 dm. high, cinereous-puberulent: leaves narrowly oblong, entire: corolla 20–25 mm. long, flaring at the top.—*S. integrifolia*, var. *brevifolia* Gray in E. Hall, Pl. Tex. no. 458 (1873), name only. *S. brevifolia* Gray, Syn. Fl. ii. 380 (1878).—Northeastern Texas, on dry calcareous hills or rocky bluffs. The following specimens

represent the range and habit of the variety. *E. Hall*, no. 458 (P); *J. Reverchon*, nos. 440, 2059, 771 (M) and 2126 (M); *G. W. Letterman*, Texarkana, October 15–24, 1894, and Dallas, August, 1882.

This form was first given recognition by Dr. Gray as a variety of *S. integrifolia*, but was later raised to specific rank. It is, however, merely a variety of *S. resinosa*. An inspection of the range of *S. integrifolia* shows that it has no representative in Texas except var. *hispida*. Finally, the nutlet of *S. brevifolia* is an exact duplicate of that of *S. resinosa*. Although with leaves somewhat longer than those of the ordinary *S. resinosa* (about 1 cm.) a quirk in the nomenclatorial rules gives to this plant the somewhat paradoxical name of *S. resinosa*, var. *brevifolia*. Originally connected with *S. integrifolia*, the application of the name was apparent.

13. S. Drummondii Benth. Fig. 11. Stems many, erect, branching at the base, villous-pubescent, mostly 1–2.5 dm. high: leaves slightly petioled or subsessile, oblong-ovate or oval, entire, 1–2 cm. long, or commonly less, undulate-crenate: calyx villous, frequently tinged with purple: corolla short, 8–12 mm. long, bluish purple or violet; the lower lip exceeding the upper, flaring, notched, violet-spotted: nutlets yellowish to dark brown, or blackish with age, with conical or frequently laminate processes.—Lab. Gen. et Sp. 441 (1832–1836). —*S. Helleri* Small, Fl. So. U. S. 1024 (1903).—Mostly on rich plains or in open woods throughout Texas, in adjacent Oklahoma and New Mexico, and running into Mexico. The following sheets are representative. New Mexico: *C. Wright*, nos. 1539 and 1540. Oklahoma: *G. W. Stevens*, nos. 695 and 1078. Texas: *S. M. Tracy*, no. 7994; *G. Thurber*, San Antonio, April, 1853; *F. Lindheimer*, nos. 1095 and 143; *E. Hall*, no. 456; *B. F. Bush*, no. 627; *E. J. Palmer*, nos. 9685 (M) and 13482 (M); *G. Jermy*, no. 101 (M); *W. M. Canby*, no. 201 (M); *J. Reverchon*, no. 2065 (P); *H. A. Pilsbry*, New Braunfels, April 17–19, 1903 (P); *A. A. Heller*, no. 1503 (P); *H. C. Hansen*, no. 542 (M).

Somewhat variable in the size of respective parts, this species is yet constant enough not to warrant any breaking up into subdivisions. The shape of the corolla is especially constant. The nutlets serve to indicate a connection with the *S. nervosa–S. parvula* group.

14. S. cardiophylla Engelm. & Gray. Stems slender, upright, branching, 3–6 dm. tall, puberulent, often purplish-tinted on the lower part: leaves petioled, deltoid or subcordate, mostly obtuse, crenate, 1.5–4 cm. long: inflorescence loose, leafy-bracted: corolla slender, 12–17 mm. long, blue: crest of calyx commonly purple: nutlets black, tuberculate with truncate processes, never merely granular as in *S. resinosa*.—Pl. Lindh. i. 19 (1845).—Arkansas and Texas, on gravelly hillsides or sandy woods. The following sheets

are representative. Arkansas: *F. L. Harvey*, no. 114; *E. J. Palmer*, no. 10503 (M); *G. W. Letterman*, Hot Springs, August 4, 1879 (M), and July or August, 188- (M). Texas: *J. Reverchon*, no. 3910; *R. A. Dixon*, no. 339; *F. Lindheimer*, no. 144; *E. Hall*, no. 454; *E. J. Palmer*, no. 7887 (M); *H. Eggert*, Palestine, June 10, 1899.

A distinct species with achenes that show closer relation to *S. pilosa* than to any other *Scutellaria*. The leaves also suggest a relation. It is interesting to note that toward the west *S. pilosa* runs out in Arkansas, though no intermediate forms between these two are found.

15. S. pilosa Michx. Stem erect, mostly slender and simple, the inflorescence sometimes branched, finely pubescent or hirsute, 2–7 dm. high; internodes frequently 10 cm. long: leaves petioled, crenate; the lower ovate or oblong-ovate, obtuse, abrupt or even truncate at the base, 2–8 cm. long; the upper subsessile and somewhat oblong-spathulate: corolla slender, bluish, 1–1.5 cm. long; lips subequal; the upper arched: calyx villous: nutlets with protuberances as in *S. serrata* (fig. 13) but smaller (1–1.5 mm. in diam.).—Fl. Bor.-Am. ii. 11 (1803). ? *S. caroliniana* Walt. Fl. Car. 163 (1788). Including var. *β* Benth. (*S. ovalifolia* Pers. Syn. ii. 136 (1807)) and *S. altamaha* Small, Fl. So. U. S., 1022 (1903).—River-banks or woodlands, New York to Michigan and southward to Georgia and Texas. The following are characteristic: New York: *J. Schenk*, Long Island, June 28, 1878 (M). Pennsylvania: *T. C. Porter*, Easton, July 10, 1868 (P); *B. Long*, Lancaster, June 22, 1909 (P). New Jersey: *C. W. Short*, Princeton, July 11, 1850 (P); *B. Long*, no. 5641 (P). District of Columbia: Washington, *E. S. Steele*, June 15, 1896. Virginia: *A. H. Curtiss*, Bedford County, June 15, 1871; *H. D. House*, no. 1046. West Virginia: *J. M. Greenman*, no. 478 (M). North Carolina: *J. R. Churchill*, Hot Springs, June 1, 1899; *A. A. Heller*, Hickory, June 23, 1893 (P). South Carolina: *W. Stone*, no. 546 (P); *Rev. J. Backman*, Charleston. Georgia: *A. H. Curtiss*, no. 6826 (M); *R. M. Harper*, no. 1358. Alabama: *C. Mohr*, Mobile, May, 1884 (M); *F. S. Earle & C. F. Baker*, Auburn, June 5, 1897 (M). Mississippi: *J. Skehan*, no. 77; *S. M. Tracy*, no. 4451. Louisiana: *J. Hale*, Alexandria (P); *C. R. Ball*, no. 656 (M). Texas: *C. Wright*. Oklahoma: *G. W. Stevens*, no. 2732. Arkansas: *N. M. Glatfelter*, Eureka Springs, July 17, 1898 (M). Missouri: *E. J. Palmer*, no. 5802 (M); *B. F. Bush*, no. 667 (M). Tennessee: *H. Eggert*, Sherwood, June 6, 1897 (M); *T. H. Kearney*, no. 871 (M). Kentucky: *C. W. Short*, Lexington (P). Indiana: *C. C. Deam*, no. 20417. Michigan: (M) no. 109374. Illinois: *E. J. Palmer*, no. 15399.

Var. hirsuta (Short) Gray. Like the preceding but taller and with leaves having coarser crenations, and longer pubescence.—Syn. Fl. ii. 379 (1878). *S. hirsuta* Short, Cat. Pl. Ken. 8 (1835).—Not a very marked variety; found only in northern Kentucky. We have examined the following sheets, all collected by *C. W. Short:* Louis-

ville, September, 1835 (P), 2 sheets; 1842, 2 sheets; 1842, no. 109393 (M); 1846, no. 109395 (M); 1848, nos. 109394 (M), 109396 (M), and 109397 (M).

16. S. INTEGRIFOLIA L. FIG. 10. Erect, simple or branched at the top, 2–7 dm. tall, covered with fine puberulence: the upper leaves linear-oblong, gradually narrowed (when present) to the short petiole, 1.5–6 cm. long; the lower strongly petioled, ovate or cordate, obtuse, crenate, sometimes deciduous, leaving the stem with only entire leaves: corolla 18–24 mm. long, bluish or purple; the lower lip very ampliate; the upper broad and arching: nutlets with flattish papillae giving it a rosulate appearance.—Sp. Pl. ii. 599 (1753). *S. hyssopifolia* L. Sp. Pl. ii. 599 (1753). *S. polymorpha* Hamilt. Monog. 38 (1832).—Low moist ground from Massachusetts south to Florida and Mississippi. The following are representative. PENNSYLVANIA: *E. B. Bartram*, no. 1078; *F. W. Pennell*, no. 69 (P); *H. W. Pretz*, no. 7559 (P). NEW JERSEY: *B. Long & S. Brown*, no. 17 (P); *W. Stone*, Medford, July 4, 1910 (P). DELAWARE: *E. Tatnall*, Wilmington, 1886, Porter, June 6, 1874. MARYLAND: *W. R. Maxon*, no. 5918. VIRGINIA: *A. A. Heller*, no. 930; *B. L. Robinson*, Buckroe, May 21, 1912. NORTH CAROLINA: *T. G. Harbison*, Waynesville, July 1, 1897; *Biltmore Herbarium*, no. 954. SOUTH CAROLINA: *J. Perkins*, Summerville, April 29–May 10, 1918; *J. Davis*, no. 8381 (M). GEORGIA: *H. Eggert*, Belair, May 22, 1899 (M). FLORIDA: *S. M. Tracy*, no. 9162; *A. A. Eaton*, no. 1410. ALABAMA: *A. Ruth*, no. 540 (M); *C. Mohr*, Mobile, May, 1891 (M). KENTUCKY: *C. W. Short*, Flats of Red River (P). TENNESSEE: *A. Ruth*, no. 120; *H. Eggert*, Tullahoma, June 9, 1897 (M). MISSISSIPPI: *J. Skehan*, no. 63.

Var. MAJOR Chapm. More rigid in habit, rather heavily pubescent, 2–8 dm. high; with several pairs of dentate, petioled basal leaves, these larger than the bracts.—Fl. So. U. S. 323 (1860). Incl. *S. arenicola* Small, Bull. Torr. Bot. Club, xxv. 143 (1898).—Low sandy locations, Georgia and Florida to Mississippi. The following specimens are characteristic. FLORIDA: *A. H. Curtiss*, nos. 2060 and 2058; *G. V. Nash*, no. 1316; *A. A. Eaton*, no. 1153; *H. J. Weber*, no. 514 (M). MISSISSIPPI: *S. M. Tracy*, no. 4453 (M); *J. Skehan*, Ocean Springs, May 8, 1895 (M) and no. 62. GEORGIA: *Mrs. Say* (?), Savannah (P).

Var. HISPIDA Benth. A slender form, reddish in color when dried, stem and leaves distinctly pilose: the leaves thin: the crenate basal ones, when present, not exceeding the upper cauline leaves.—Lab. 435 (1832–1836).—Florida to Arkansas and Texas on moist sandy ground. The following are characteristic. FLORIDA: *A. H. Curtiss*, no. 6645 (M); *S. M. Tracy*, no. 9162 (M), (M) no. 109080. GEORGIA: *H. Eggert*, DeKalb Co., July 24, 1897; (M) no. 788487. LOUISIANA: *J. Hale*, Alexandria (P); *E. J. Palmer*, no. 7604 (M); *C. R. Ball*, no. 517; *J. F. Joor*, Madisonville, May 4, 1888 (M); *T. Drummond*, no. 248. TEXAS: *J. Reverchon*, no. 2127 (M); *E. Hall*, no. 455. ARKANSAS: *E. J. Palmer*, no. 10522 (M), *H. Eggert*, Jefferson Co., June 8, 1898 (M).

Var. MULTIGLANDULOSA Kearney. A short-stemmed leafy form, never exceeding 2.5 dm.; puberulent or pilose on the leaf-nerves and margins and on the stem: leaves oblong-ovate or spatulate, slightly, if at all petioled, entire, revolute-margined; occasionally 1–3 pairs of small, dentate petioled basal leaves, but these always shorter than the upper: flowers in the upper axils, the inflorescence appearing scarcely racemose: corolla as in the species.—Bull. Torr. Bot. Club, xxi. 482 (1894).—Pine barrens or dry open ground, Georgia and Florida to Louisiana. The following are characteristic. FLORIDA: *A. S. Hitchcock*, Suwanee Co., June–July, 1898 (M), and no. 477 (M); *C. S. Williamson*, Palatka, April, 1897 (P); *Dr. Leavenworth*, Fort King (P). GEORGIA: *R. M. Harper*, no. 822. ALABAMA: *Gates & Jewett*, Mobile. LOUISIANA: *E. J. Palmer*, no. 7959 (M).

Var. **glabriuscula** (Fernald), n. comb. Much like the variety *hispida*: slender, 2–5 dm. high, simple or branched, very slightly pubescent or glabrous: inflorescence racemose: leaves on distinct petioles, practically glabrous; the lower sometimes dentate: corolla subglabrous.—*S. glabriuscula* Fernald, Bot. Gaz. xxxiii. 156 (1902). "*S. hyssopifolia* L." on many herbarium sheets, *nomen dubium*.—Mostly on sandy pine lands, Georgia and Florida to Mississippi. The following serve to represent the variety. GEORGIA: *R. M. Harper*, no. 885. FLORIDA: *A. H. Curtiss*, nos. 6097, 3, and 13425 (M); *G. V. Nash*, no. 2277. ALABAMA: *H. Eggert*, Cullman, June 18, 1897 (M); *F. S. Earle & C. F. Baker*, Evergreen, June 6, 1897 (M). MISSISSIPPI: *J. Skehan*, no. 22603; *S. M. Tracy*, no. 4900.

Var. **floridana** (Chapm.), n. comb. A very slender linear-leaved form, minutely pubescent: lips of the corolla very broad.—*S. floridana* Chapm. Fl. So. U. S. 324 (1860).—Probably confined to the pine barren swamps near Apalachicola in western coastal Florida. The following are representative. (M) nos. 788588 (Apalachicola), 108997 (*D. U. Dean*), 108999, 109000 (Herb. Chapm.); *A. W. Chapman*, no. 13207 (M), and Apalachicola (ex. Herb. J. Carey).

17. S. BUSHII Britton. FIG. 15. Erect, mostly caespitose in habit; stems simple, whitish-pubescent or puberulent, 1.5–3.5 dm. high: leaves entire, oblanceolate, obtuse, sessile: nutlets with more wart-like, less rosulate papillae: otherwise as in *S. integrifolia* var. *multiglandulosa* to which it is nearest related.—Man. 785 (1901).—Rocky barrens or hillsides in Carter and Shannon Counties, MISSOURI. The following are representative: *B. F. Bush*, nos. 49 (M). 189, 378, 7817 (M), 461 (M), 48 (M), 4737 (M); *E. J. Palmer*, no. 19496.

18. S. CANESCENS Nutt. FIG. 14. Erect, tall, much branched at the top, canescent throughout except the upper surface of the leaves, 3–12 dm. high: leaves ovate-lanceolate, acute to cordate at the base, crenate, usually glabrous above, 5–12 cm. long, on petioles 1.5–4 cm. long: inflorescence mostly paniced: corolla 18–25 mm. long; upper lip very much arched over the shorter lower one: nutlets with truncate papillae, brownish, close to those of *S. serrata* but smaller and with blunter papillae.—Gen. ii. 38 (1818). *S. incana* Muhl. Cat.

56 (1813), *nomen submudum*.—Dry woods, river-banks, etc., Pennsylvania to Wisconsin and south to Arkansas and Georgia. The following represent the plant and its range. PENNSYLVANIA: *O. E. Jennings*, Glenshaw, August 3, 1918; *T. C. Porter*, Huntingdon Co. INDIANA: *C. C. Deam*, no. 5183. ILLINOIS: *H. A. Gleason*, no. 2617. WISCONSIN: *T. J. Hale*, Lake Pepin, 1861. KANSAS: *A. S. Hitchcock*, no. 797. MISSOURI: *B. F. Bush*, no. 6113; *E. E. Sherff*, no. 635. ARKANSAS: *F. L. Harvey*, no. 109. TENNESSEE: *S. M. Bain*, no. 323. KENTUCKY: *C. W. Short*, 1840 (M). WEST VIRGINIA: *W. M. Pollock*, Upshur Co., July 8, 1895 (M). NORTH CAROLINA: *T. G. Harbison*, Waynesville, May 30, 1897. GEORGIA: *R. M. Harper*, no. 1368.

Var. PUNCTATA Chapm. Like above but with foliage glabrate and densely punctate.—Fl. So. U. S. 323 (1860).—North Carolina, Georgia and Florida. The following are characteristic. NORTH CAROLINA: *J. D. Smith*, August 7, 1882, *C. S. Williamson*, Balsam, July, 1897. GEORGIA: *J. K. Small*, Rabun Co., August 11, 1893; *C. S. Williamson*, Atlanta, August, 1896. FLORIDA: *G. V. Nash*, Bellair, September 3, 1895, (M) nos. 108778 and 108875.

19. S. SERRATA Andr. FIG. 13. Stem erect, 2.5–6 dm. high, nearly always simple, with from 3–5 pairs of leaves: leaves thin, mostly glabrous, ovate, acuminate at both ends or rounded at the base, serrate or crenate, 2.5–10 cm. long, on slender petioles 2.5 cm. or less long; the lower pairs smaller; the floral leaves abruptly reduced and becoming entire: inflorescence with rare exceptions a simple terminal raceme: corolla violet-blue, 2–3 cm. long; the lower lip nearly equalling the upper, sometimes appearing longer by protrusion at right angles from the tube: nutlets dark brown, about 2 mm. in diameter, with obtusely pointed papillae.—Bot. Rep. t. 494 (1808). *S. laevigata* Aiken in Eaton, Man. ed. 6: 333 (1833).— Woods and damp habitats, Pennsylvania to Missouri and North Carolina. The following represent the plant and its range. PENNSYLVANIA: *G. W. Smith*, Delaware Co., June 23,— (P); *J. Pennell*, no. 2713 (P); *E. B. Bartram*, Darby Creek, July 21, 1907 (P); *U. C. Smith*, no. 1177 (P). MARYLAND: *J. D. Smith*, Patapsco Valley, Howard Co., May 25, 1881; *J. J. Carter*, Conowingo, June 1, 1906. DISTRICT OF COLUMBIA: *E. S. Steele*, Washington, May 19, 1896; *T. Morong*, May 21, 1877 (M). WEST VIRGINIA: *F. W. Hunnewell*, July 4–6, 1914. VIRGINIA: *S. B. Buckley*, June, 1838 (M); *A. H. Curtiss*, Bedford Co., June 6, 1872 (M); *H. D. House*, no. 858 (M). NORTH CAROLINA: *W. W. Ashe*, no. 6445; *Biltmore Herbarium*, Biltmore, no. 1250b. TENNESSEE: *A. Ruth*, no. 116. ILLINOIS: ex. Herb. *G. Thurber*. MISSOURI: Pilot Knob, June 17, 188-.

Var. **montana** (Chapm.), n. comb. Similar to above, but stems and leaves glandular-pubescent; occasionally the upper leaves nearly hastate or very simply serrate: corolla bluish, strongly ampliate upward, 3 cm. or slightly more in length.—*S. montana* Chapm., Bot. Gaz. iii. 11 (1878). Inc. *S. Mellichampii* Small, Fl. 1022 (1903).—

In the mountains of northern Georgia, western North Carolina, South Carolina, southern Tennessee, and northern Alabama. The following are representative. South Carolina: *Mellichamp*, no. 14 (M), and Bluffton, 1872 (M). Georgia: *A. W. Chapman*, Rome (M); (M) nos. 109124, 109125, 788591 and 109485. North Carolina: *T. G. Harbison*, Highlands, July 20, 1904. Tennessee: *J. R. Churchill*, Chattanooga, May 21, 1911; *J. F. James*, Spring City, June 11, 1883. Alabama: *H. Eggert*, Springville, July 7, 1898; *S. Watson*, Queensboro, 1857.

20. S. versicolor Nutt. Fig. 9. Erect, glandular-hairy, especially in the inflorescence, which is commonly branched, 2–8 dm. high: leaves broad, cordate, rugose, crenate, 3–12 cm. long, long-petioled: corolla 1.7–2.5 cm. long, slender up to the throat, ampliate at the lips, blue to purple at the limb, but whitish on the tube: nutlets buff to orange in color, the processes tuberculate-conical.—Gen. ii. 38 (1818). ? *S. cordifolia* Muhl., Cat. 56 (1813), *nomen subnudum*. *S. cordifolia* var. *pilosissima* Mack. & Bush, Trans. Acad. Sci. St. Louis, xii. 84 (1902), in part.—Wisconsin and Iowa to Louisiana and eastward to North Carolina. The following are representative. Wisconsin: *T. J. Hale*, Maiden Rock, 1861 (M); *Lapham* (P). Iowa: *A. S. Hitchcock*, Iowa City, 1888; *C. R. Ball*, no. 1588 (M). Illinois: *F. C. Gates*, no. 10828 (M); *O. E. Lansing*, no. 62; *H. C. Skeels*, no. 388; *E. E. Sherff*, no. 320; *H. A. Gleason*, no. 1842. Missouri: *B. F. Bush*, nos. 5851, 725 (M). Arkansas: no. 5912 (M). Louisiana: *Dr. Carpenter*, Jackson, June; *E. J. Palmer*, no. 7601. Mississippi: *S. M. Tracy*, no. 4896. Kentucky: *S. F. Price*, Bowling Green. Tennessee: *E. J. Palmer*, no. 17640 (M). Ohio: *E. L. Moseley*, Margaretta, June 6, 1895. Virginia: *A. H. Curtiss*, Peaks of Otter, August 6, 1871. Maryland: *W. E. A. Aikin*, Harper's Ferry. North Carolina: *R. Thaxter*, Cullowhee, June 15–July 15, 1887; *C. S. Williamson*, Weldon, August, 1892 (P). Grades gradually into

Var. bracteata Benth. This form as found in Texas is very distinct, with floral bracts showy and much exceeding the combined length of pedicel and calyx. The leaves of the stem gradually merge into the bracts.—Lab. Gen. et Sp. 433 (1832–1836). *S. cordifolia* var. *pilosissima* Mack. & Bush, Trans. Acad. Sci. St. Louis, xii. 84 (1902), in part. *Lindheimer's* no. 492, *J. Reverchon's* nos. 769 and 253, and *C. Wright's* no. 476 are typical. It is probable also that certain plants from Arkansas and Missouri should be referred here, but one hardly knows where to stop.

Var. minor Chapm. Very similar to typical *S. versicolor*, having its diminutive size but with much smaller ovate, rugose leaves.—Fl. So. U. S. 323 (1860). *S. rugosa* Wood, Cl. Bk. 246 (1848).[1]

In his earliest description Chapman allocates this form to the "dry woods near Washington, Wilkes County, Ga.," and later he merely states "upper districts." The plants which seem most logi-

[1] In later editions of his Class Book, Wood reduces his *S. rugosa* to *S. saxatilis*.

cally to be referred to this category occur rather scatteringly on the southern edge of the range of *S. versicolor*, and some of the specimens are not distantly related to *S. saxatilis*. However, Chapman had a different plant in mind. The following are taken as representatives. MISSOURI: *W. Trelease*, no. 721 (M); *B. F. Bush*, no. 791 (M); *K. K. Mackenzie*, Eagle Rock, September 23, 1896 (M). ARKANSAS: *E. J. Palmer*, no. 4750 (M). A plant collected at Harper's Ferry, and answering to the description of *S. rugosa*, collected at the same place, is also included here.

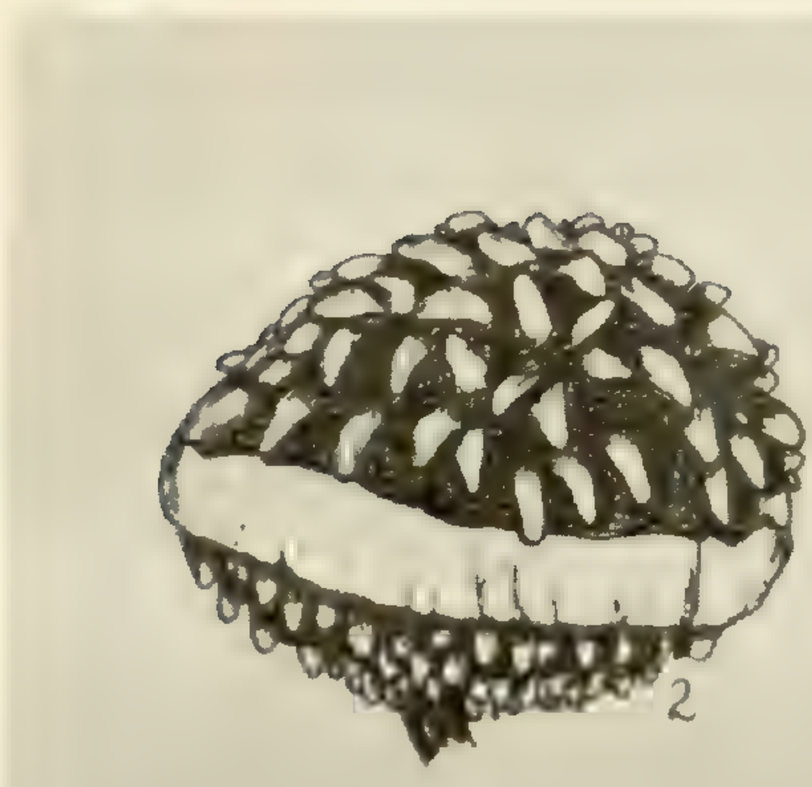
21. S. SAXATILIS Riddell. Erect, or somewhat assurgent and weak, glabrous or somewhat hairy, 1–5 dm. long: leaves thin, with few spreading hairs on the upper surface, obovate or cordate, obtuse, long-petioled; the upper crenate-serrate; bracts entire: corolla about 2 cm. long, slender; the upper lip not arched, nearly as in *S. versicolor*: nutlets resembling those of *S. versicolor*, but the protuberances somewhat longer and more acute.—Supp. Cat. Ohio Pl. 14 (1836).—Rocky woodlands from Pennsylvania to Kentucky and Tennessee. PENNSYLVANIA: *J. A. Schafer*, Jacobs Creek, Westmoreland County, July 20, 1900 (P); *C. S. Williamson*, Ohio Pyle, August 31, 1905. NEW JERSEY: *C. F. Parker*, no. 6619 (M). DELAWARE: *E. Tatnall*, Wilmington, September 8, 1858. DISTRICT OF COLUMBIA: *W. R. Maxon*, no. 6242. OHIO: *H. N. Mertz*, Steubenville, June 5, 1880 (P). WEST VIRGINIA: *Mr. & Mrs. E. S. Steele*, no. 31 (M). KENTUCKY: *C. W. Short*, no. 2 (P). TENNESSEE: *A. Ruth*, no. 545 (M); *A. H. Curtiss*, no. 2054.

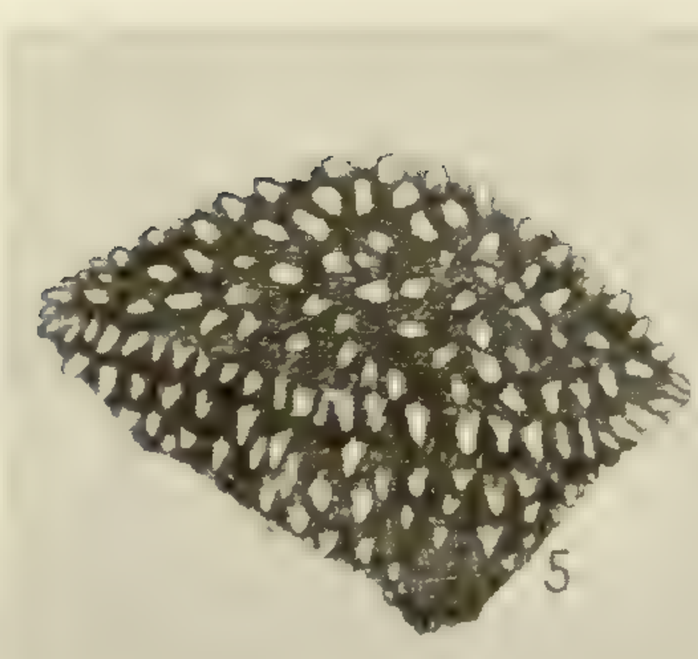
Var. **arguta** (Buckley), n. comb. This is doubtfully given rank as a variety of the above. It is small, assurgent, with ovate, sharply dentate leaves scatteringly pilose, and is confined to the mountains of North Carolina and Tennessee.—*S. arguta* Buckley, Am. Journ. Sci. xlv. 170, 177 (1843).—The following represent the plant. NORTH CAROLINA: *Biltmore Herbarium* (G), no. 7171; TENNESSEE: *A. Ruth*, no. 119, 8.

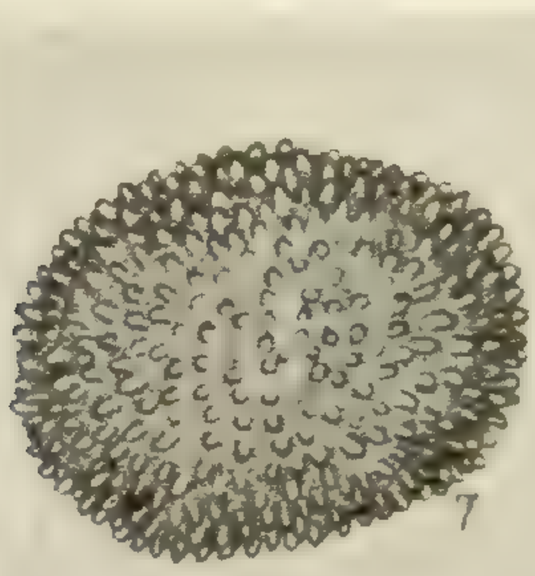
COLORADO COLLEGE,
Colorado Springs, Colorado.

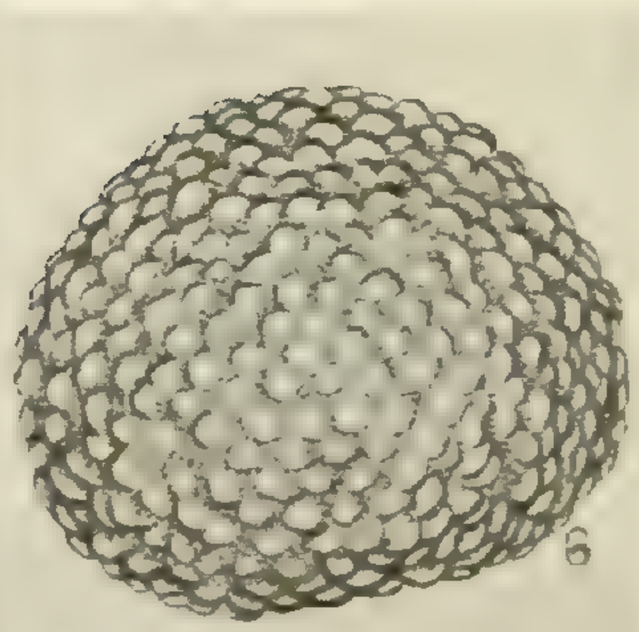
EXPLANATION OF PLATES 140 AND 141.

Nutlets of *Scutellaria*, about × 25. Fig. 1, *S. nervosa*; fig. 2, *S. parvula*; fig. 3, *S. angustifolia*; fig. 4, *S. antirrhinoides*; fig. 5, *S. nana*; fig. 6, *S. epilobiifolia*; fig. 7, *S. lateriflora*; fig. 8, *S. resinosa*; fig. 9, *S. versicolor*; fig. 10, *S. integrifolia*; fig. 11, *S. Drummondii*; fig. 12, *S. tuberosa*; fig. 13, *S. serrata*; fig. 14, *S. canescens*; fig. 15, *S. Bushii*.



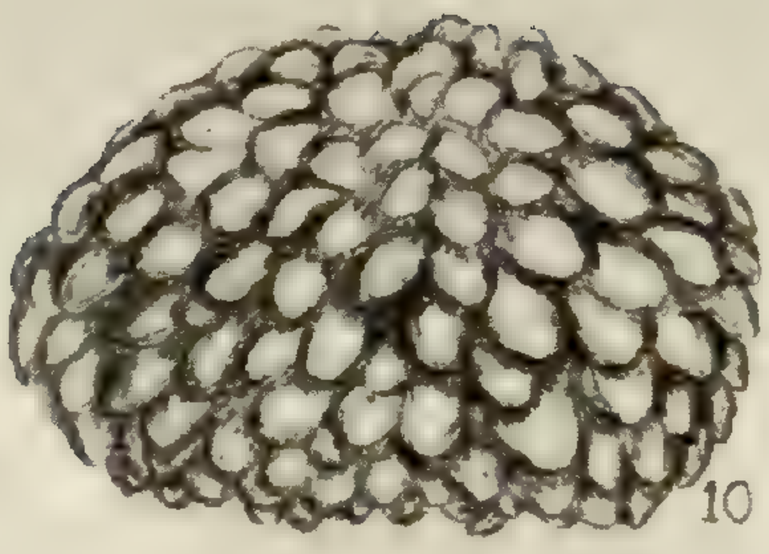






C. W. P. del.

NUTLETS OF SCUTELLARIA.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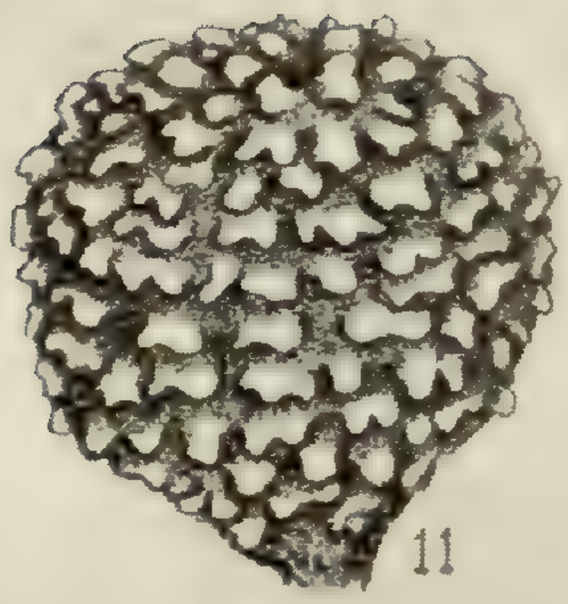
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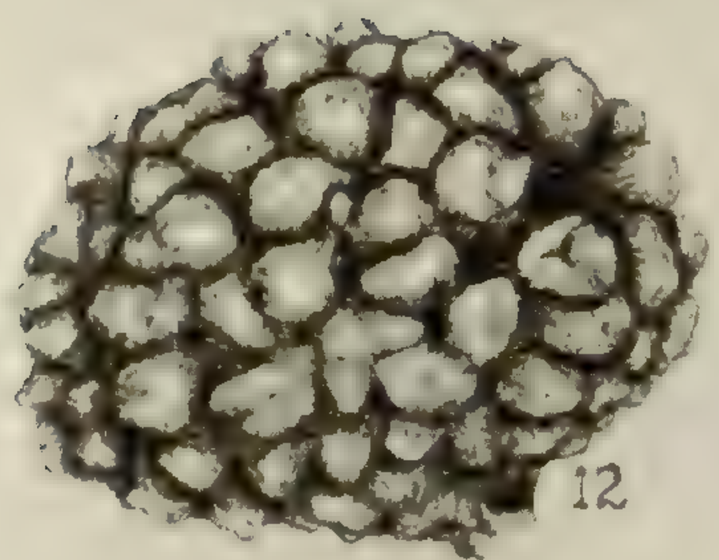
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C. W. P. del.

NUTLETS OF SCUTELLARIA.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY .

NEW SERIES, No. LXXII

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By M. L. FERNALD

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—New Series.—No. LXXII.

M. L. Fernald.

I. POLYSTICHUM MOHRIOIDES AND SOME OTHER SUBANTARCTIC OR ANDEAN PLANTS IN THE NORTHERN HEMISPHERE.

Polystichum mohrioides (Bory) Presl, var. **scopulinum** (D. C. Eaton), n. comb. *Aspidium aculeatum*, var. *scopulinum* D. C. Eaton, Ferns of N. A. ii. 125, t. lxii. fig. 8 (1880). *P. scopulinum* (D. C. Eaton) Maxon, Fern Bull. viii. 29 (1900). *P. aculeatum scopulinum* (D. C. Eaton) Gilbert, List N. A. Pterid. 20 (1901). *P. Lonchitis*, var. *scopulinum* (D. C. Eaton) Jones, Bull. Univ. Mont., Biol. Ser. xv. 7 (1910).

After several times collecting and studying during a period of nearly twenty years this anomalous plant, which has been treated as a variety of *Polystichum aculeatum* or of *P. Lonchitis*, as *P. mohrioides* and as a distinct species standing midway between *P. aculeatum* and *P. mohrioides*, I find myself firmly convinced that its relationship is primarily with the latter plant and that it is at best a northern variety of that wide-ranging austral species. *P. mohrioides* was discovered on the Falkland Islands (les Malouines) by D'Urville & Lesson during the voyage around the world of the French corvette, La Coquille. It was described by Bory de St.-Vincent as *Aspidium Mohrioides* and beautifully illustrated.[1] Gradually our knowledge of the plant has been extended and *P. mohrioides* in one form or another has been found to have a wide and very distinctive range, one which, with some modifications, is duplicated in several other groups of plants.

[1] Bory in Duperrey, Voyage autour du Monde sur La Coquille, Bot. pt. 1: 267, t. 35, fig. 1 (1829).

West of the Falkland Islands it is found on Tierra del Fuego, whence it follows slightly northward on the high Andes as *P. mohrioides*, var. *plicatum* (Poeppig) Christensen[1] or *P. andinum* Phil., which differs from the Falkland plant only in its dwarf size (growing in exposed alpine habitats) and in the paler and thinner scales of the stipe. Skottsberg got a form of *P. mohrioides* on South Georgia, 800 miles (1290 km.) southeast of the Falklands; Moseley, during the voyage of the Challenger, collected an extreme form on Marion Island, 1200 miles (1930 km.) southeast of the Cape of Good Hope and more than 3000 miles (4800 km.) northeast of South Georgia; and the next year De l'Isle discovered the species on Amsterdam Island, more than 2000 miles (3200 km.) east of Marion Island. Northward, in the Andes, it occurs as *P. mohrioides*, var. *elegans* (Remy) Christensen[2] or *P. elegans* Remy, an extreme with longer and more divided pinnae.

In North America two members of this alliance are recognized: *P. Lemmoni* Underwood and *P. scopulinum* (D. C. Eaton) Maxon, both confined to arid regions of the Sierra Nevada-Cascade axis, with the exception of four isolated stations for the latter, one each in the Teton Mts. of Idaho, the Mission Mts. of Montana, the Wasatch Mts. of Utah and the Shickshock Mts. of Gaspé Co., Quebec. So close are these North American plants to those of the southern Andes and the Falklands that the late D. C. Eaton, after trying to find specific differences, described and illustrated[3] as typical *P. mohrioides* (or *Aspidium mohrioides*) the Californian *P. Lemmoni* and at the same time, in describing his *Aspidium aculeatum*, var. *scopulinum*, he surmised that it belonged with *P. mohrioides*, saying: "I have some doubt about the plant here named var. *scopulinum*, as it differs more from all the rest than any of them do from each other. It has a little the habit of *A. mohrioides*, but, though the specimens I have seen are old, they still keep in a degree the aculeate points of the present species."[4] And again he wrote that his var. *scopulinum* was "almost as much like *A. mohrioides* as it is like *A. aculeatum*, but as it has the lobes of the pinnae somewhat aculeate it is better to leave it with the latter species."[5] As already stated, Eaton had tried to find specific characters for *P. Lemmoni* but was unable to do

[1] Christensen, Arkiv för Bot. x. No. 2: 17 (1910).
[2] Christensen, l. c. (1910).
[3] Eaton, Ferns of N. A. ii. 251, t. lxxx. figs. 4–9 (1880).
[4] Eaton, l. c. 127, 128.
[5] Eaton, l. c. 254.

so, saying clearly of the Lemmon plant: "At first I believed it to be a distinct species."[1] Similarly the great Swiss specialist upon the ferns, Christ,[2] in monographing *Polystichum* § *Mohrioides* had no hesitation in treating *P. Lemmoni* as identical with *P. mohrioides* (which, as understood by him, was chiefly var. *elegans*).

In his discussion of the ferns of temperate South America collected by Skottsberg, Christensen[3] points out the important characters which separate *P. mohrioides* from *P. aculeatum* and its allies; namely, the fleshy texture, scaleless surfaces of the fronds, thick and flat ribs and the large and immersed stomata (so immersed that under a good lens the lower surfaces of the fronds appear pitted or punctate). The fleshy texture, flat ribs and punctate lower surfaces are all obvious enough in *P. scopulinum*, and the fronds are either with or without some scales on the lower surface, but this latter character is inconstant, some sheets of perfectly good *P. mohrioides*, var. *typicum* Christensen from the Falkland Islands (coll. *Cunningham*, January 21, 1868) before me showing numerous slender scales among the sori. The Cunningham specimens are quite like the original plate of *Aspidium mohrioides* and in outline, size, texture and punctation they are so close to several North American specimens of *P. scopulinum* that only the keenest inspection reveals slight differences. Thus Parish's material from Snow Canyon, San Bernardino Co., California, is a very close match in all these characters for the Cunningham plant and for the original plate. All the Falkland material I have seen, however, has the basal scales of the stipe darker and firmer than in *P. scopulinum*, although the Fuegian specimens (var. *plicatum*) have them as pale and thin.

P. scopulinum is regularly defined as differing from *P. mohrioides* and *P. Lemmoni* in the sharper and more acicular tips of the upper lobes or teeth of the pinnae. In general this character holds, but in the Cunningham material from the type-region of *P. mohrioides* the teeth of the lower pinnae are quite as sharp as in some of the North American plants, while in the Parish material above cited only the lowest pinnae show the sharp teeth, the upper having them quite as blunt as in the most ideal *P. mohrioides* or in *P. Lemmoni*. Furthermore the plant of Marion Island has some of the pinnae quite as spinulose-toothed as in the most extreme *P. scopulinum*.

[1] Eaton, l. c. 128.

[2] Christ, *Ueber die australen Polystichum-Arten*. Arkiv för Bot. iv. No. 12: 1–3 (1905).

[3] Christensen, l. c. 18.

Reference has been made to the fact that neither D. C. Eaton nor Dr. Christ could distinguish *P. Lemmoni* from *P. mohrioides*, var. *elegans*. Well developed fronds of the two are almost identical and *P. Lemmoni* has the scaleless surfaces of theoretical *P. mohrioides*, and the pits in its lower faces are unusually conspicuous. In only one character, apparently, can the two be distinguished with satisfaction: in var. *elegans* the scales at the base of the stipe are castaneous and subcoriaceous as in typical *P. mohrioides;* in *P. Lemmoni* paler and thinner as in vars. *plicatum* and *scopulinum*. In their extremes *P. Lemmoni* and *P. mohrioides*, var. *scopulinum* are well differentiated, but certain small plants of the former too closely simulate plants of the latter with unusually pinnatifid pinnae; and in view of their both possessing the essential characters of *P. mohrioides* and the failure of the spinulose teeth of var. *scopulinum* to retain the constancy one might wish them to, it seems the part of sound classification to treat *P. Lemmoni* as

P. MOHRIOIDES, var. **Lemmoni** (Underw.), n. comb. *Aspidium mohrioides* D. C. Eaton, Ferns of N. A. ii. 251, t. lxxx. figs. 4–9 (1880), as to Lemmon plant figured. *P. Lemmoni* Underw. Our Nat. Ferns, ed. 6: 116 (1900).

Besides agreeing in all their fundamental specific characters, typical *P. mohrioides* and its vars. *scopulinum* and *Lemmoni* are amazingly similar in their selection of habitat. Bory's statement, based upon the observations of the original collectors of the Falkland plant, was that "elle croît dans les fentes des rochers" and the latest statement, by Skottsberg, is similar: "Rocky places, often deep down in crevices," while in the "stone-runs" "Two ferns are found in solitary tufts between the blocks, *Blechnum magellanicum* and *Polystichum mohrioides*, both finely developed."[1] How strikingly like Eaton's account of the type-station of var. *Lemmoni:* "Mr. Lemmon writes that this fern grows in loose and moist granitic soil, the root-stocks hidden under rocks;"[2] or like Bradley's account of the type-region of var. *scopulinum* in the Teton Canon of Idaho: "we climbed a sharp slope of stumbling rubbish, and then found ourselves on a narrow crest, overlooking an immense cañon, the Great Téton Canon . . . . The descent from this crest is very steep; and, in dodging falling masses of rock, started by those behind him, Mr. Bechler unfortunately

[1] Skottsberg, *A Botanical Survey of the Falkland Islands*, Kungl. Svenska Vetenskapsakad. Handl. 1. No. 3: 9, 114 (1913).

[2] Eaton, l. c. 252 (1880).

got a severe sprain."[1] At the isolated stations at the head of Snow Brook and on the ragged walls of Devil's Gulch on Mt. Albert, Quebec, where I have several times collected the plant, var. *scopulinum* is in dry rock-crevices (serpentine) or under broken rock whence its tough roots are most difficult of extraction. In the latter situations, where the tallest and least plicate fronds naturally develop, the fronds are often badly broken by the shifting rock-debris.

The range of the aggregate-species, *Polystichum mohrioides*, is, as already stated, similar to the ranges of several other plants, although differing, naturally, in many details. Thus *Myriophyllum elatinoides* Gaudichaud occurs on New Zealand, Chatham Island, Tasmania, the Falkland Islands, in the Andean region from Cape Horn to Ecuador, locally in Mexico, and it is known in the western United States in Arizona and Oregon.[2] *Empetrum rubrum* Vahl, characterized by white-woolly branchlets, leaves not reflexed in age and red drupes, occurs on the Falklands, along the Andes from Tierra del Fuego into Chile, on Masafuera (the western island of the Juan Fernandez group), and 2500 miles (4025 km.) east of Patagonia on Gough Island and on the islands of the Tristan da Cunha group. Outside the Subantarctic and southern Andean regions the only Empetrums are the Arctic circumpolar *E. nigrum* L. with branchlets at most minutely puberulent, the leaves reflexed in age and the berries black or purplish; and two species centering on the Gulf of St. Lawrence, *E. Eamesii* Fernald & Wiegand and *E. atropurpureum* Fernald & Wiegand, both of which have the white-woolly branchlets, non-reflexed leaves and red berries as in the Subantarctic *E. rubrum* but differ from it in more trailing habit and in seed-characters.[3]

The quaint little genus *Lilaeopsis* of the *Umbelliferae* has three strongly marked species or groups of species. One, *L. lineata* (Michx.) Greene,[4] with the linear-clavate broadly round-tipped 3–6-jointed leaves scattered and solitary along the creeping filiform stem and

[1] Bradley in Hayden, U. S. Geol. Surv. of Terr. 6 Ann. Rep. 219 (1873).

[2] See Fernald, Rhodora, xxi. 124 (1919).

[3] For further discussion, see Fernald & Wiegand, Rhodora, xv. 213–217 (1913).

[4] It is probable that, when the original plant of *Hydrocotyle chinensis* L. Sp. Pl. i. 234 (1753) is critically examined, it will prove to be *Lilaeopsis lineata*, in which case we shall have to take up for the characteristic plant of Atlantic North America the highly inappropriate name *L. chinensis* (L.) Kuntze. The Linnean description strongly suggests *L. lineata*, although the phrase "Folia . . . *saepius bina ad articulos*" is not very satisfactory. No *Lilaeopsis* is known from Asia and Linnaeus evidently had his geographic data confused. His *Hydrocotyle chinensis* has generally been referred to the all-inclusive *L. lineata* (or *Crantzia lineata*), but it is worthy of note that upon examining the Linnean type Asa Gray made the memorandum "a species of *Crantzia*," not our species, with which he was familiar.

without obvious stipular margins, and with the fruits constricted at base or pyriform, is confined to saline mud of the Atlantic coast of the United States and of southwestern Nova Scotia. The second species *L. carolinensis* Coult. & Rose, a plant with long-petioled leaves having spatulate or oblong blades up to 2.5 cm. long and 1.5 cm. broad and comparatively large globose fruits, was originally described from the southeastern United States but it is apparently found also in Paraguay (for example, *Hassler*, no. 12,271) and elsewhere in temperate eastern South America.

The third and most widely spread group of species is typified by *L. attenuata* (Hook. & Arn.) Fernald,[1] a plant characteristic of southern South America and the Andes and represented northward by *L. occidentalis* Coult. & Rose and *L. Schaffneriana* (Schlecht.) Coult. & Rose and southward by the plants of the Falkland Islands, New Zealand, Tasmania and Australia which have erroneously passed as the Atlantic North American *L. lineata* or *Crantzia lineata* (Michx.) Nutt. The published illustrations[2] of fruits indicate considerable differences and it is possible that the austral series contains other species than *L. attenuata* and *L. Schaffneriana* but without better material than is now at hand it would be unwise to attempt further subdivision. The essential point in regard to the Australian, New Zealand, Tasmanian, Falkland, Argentine and Andean plants is, that they as well as the Mexican and Pacific North American plants all differ in fundamental characters from the Atlantic North American *L. lineata;* for in them all the more elongate and slender or often attenuate leaves are tufted along the comparatively stout creeping stem, not solitary and scattered as in *L. lineata;* when well developed they show 6–13 joints instead of only 3–6 (rarely 7) and they often have scarious stipular margins which frequently persist as old shreds. Whether they finally prove to be a single species, *L. attenuata*, or several, the plants of Subantarctic regions and of temperate and Andean South America constitute, with the Mexican and Pacific North American plants, a distinct section of *Lilaeopsis*.

It is thus evident that, although differing in details of distribution, *Polystichum mohrioides, Myriophyllum elatinoides*, the red-berried Empetrums and the species of *Lilaeopsis* centering about *L. attenuata*

[1] Lilaeopsis **attenuata** (Hook. & Arn.), n. comb. *Crantzia attenuata* Hook. & Arn in Hook. Bot. Misc. iii. 346 (1833).

[2] Hook. Fl. Antarct. ii. 287, t. C. (1847); Weddell, Chloris Andina, ii. t. 68 (1861); Coult. & Rose, Bot. Gaz. xxiv. 48, 49, figs. and 4 (1897); Jepson, Madroño, i. 139, fig. 25 (1923).

are similar in having interrupted Subantarctic and Andean ranges and in occurring in the northern hemisphere only in western America or in the region of the Gulf of St. Lawrence or in both areas.

II. THE DWARF ANTENNARIAS OF NORTHEASTERN AMERICA.

(Plate 142.)

The larger species of *Antennaria* of temperate eastern America are reasonably understood, but there is another series of highly localized species, chiefly of the calcareous areas from northern Labrador to Newfoundland, eastern Quebec and the James Bay region, which have not been so clearly defined. These are the plants which have passed chiefly as *A. alpina* (L.) Gaertn. and which, with it, form a rather natural group of species. In the cordilleran region of North America these plants have attracted much attention and a large number have been proposed as species. In eastern America they occur wholly beyond the habitations of resident botanists, unless we include in eastern America botanically quite similar Greenland. The Antennarias of Greenland have been carefully treated and beautifully illustrated by Porsild;[1] but in the region immediately to the west and southwest of Greenland these plants are collected only by the chance botanical visitor and our knowledge of them, like our knowledge of the whole vast region from Gaspé and Newfoundland northward, is in very rudimentary condition. However, the necessity of properly identifying two quite distinct species discovered in 1923 on the Shickshock Mountains makes it desirable to draw into convenient form our knowledge to date of these plants. The following synopsis of the species occurring south of Hudson Straits is therefore presented, not because it is final but because it may draw attention to a group about which much more information is needed. Further exploration of Newfoundland, Anticosti Island, the Gaspé Peninsula and the Labrador Peninsula will surely bring to light many additional species; and, to judge from our experience to date, they may be most hopefully looked for on barrens and mountains of limestone, basic schists and traps.

[1] Porsild, *On the Genus Antennaria in Greenland* (Arbejder fra den Danske Arktiske Station paa Disko, Nr. 9), Meddel. om Groenl. li. 267–281 (1915).

In order properly to orient the small-leaved boreal series here specially considered, the leading features of the other sections of the genus represented in eastern America are indicated in the key.

a. Basal leaves[1] erect, oblanceolate to elliptic-acuminate, 2–16 cm. long, similar to the cauline ones: involucres of the pistillate heads brown to blackish: plants sparingly to not at all stoloniferous.

A. eucosma Fernald & Wiegand and *A. pulcherrima* (Hook.) Greene.

a. Basal leaves spreading, forming depressed rosettes, strongly contrasting in outline with the cauline leaves: plants humifuse or freely stoloniferous *b.*

b. Larger basal leaves only 1.5–5 mm. wide, blunt or barely short-mucronate *c.*

c. All the involucral bracts of the pistillate heads[2] deep-brown, drab or blackish *d.*

d. Bracts subequal, narrow; the inner linear or lanceolate and acute: heads 1–6 *e.*

e. Rosette-leaves terminated by a short but distinct glabrous mucro: corollas 3.5–5 mm. long *f.*

f. Rosette-leaves glabrous and bright-green or grayish-pubescent above: cauline leaves distant; the upper with an oblong glabrous scarious appendage: corollas 4–5 mm. long: pits of the denuded receptacle 20–30, 0.3–0.4 mm. broad, much broader than the intermediate ridges....1. *A. alpina.*

f. Rosette-leaves canescent: cauline leaves crowded; the upper with a lanceolate pubescent scarious appendage: corollas 3.5–4 mm. long: pits of denuded receptacle 60–100, 0.1 mm. broad, about as wide as the blunt-edged intermediate ridges.....2. *A. Sornborgeri.*

e. Rosette-leaves canescent, blunt, the terminal mucro obsolete or in old weather-worn leaves barely visible: corollas 3–4 mm. long *g.*

g. Cauline leaves 9–15; the median and upper tapering to a slender subulate tip; only the very uppermost with a lanceolate scarious appendage..3. *A. cana.*

g. Cauline leaves 5–8; all but the lowermost with an oblong-lanceolate flat scarious tip 1.5–3 mm. long.....4. *A. vexillifera.*

d. Bracts in about 5 outwardly shorter series, oblong, obtuse: head solitary.....5. *A. pygmaea.*

c. At least the inner bracts of the pistillate heads with white or whitish tips: basal leaves whitened above with minute pubescence *h.*

h. The 1–3 uppermost cauline leaves with slender scarious terminal appendages: rosette-leaves blunt or short-mucronate: pistillate involucres 4–7 mm. high, with appressed-ascending bracts *i.*

i. Involucre of 4–6 series of distinctly unequal pale-brown bracts.....6. *A. straminea.*

[1] By basal leaves are meant not only those of the basal rosette but the new broad leaves terminating the stolons or basal offshoots. On account of weathering the former are often bruised and uncharacteristic.

[2] The only species of this series of which staminate plants are known is *A. nitida.* The descriptions of all the others, therefore, are drawn only from pistillate plants.

i. Involucre of 2–3 (–4) series of subequal or obscurely imbricated whitish, creamy or roseate bracts *j.*
j. Indument of the rosette-leaves close and lustrous as if varnished: cauline leaves 9–18: inflorescence glomerulate: corollas 3–3.5 mm. long *k.*
k. Upper cauline leaves with scarious tips 2–2.5 mm. long: involucre not viscid, with thin bracts; the thin tips of the inner series lacerate-erose.....7. *A. albicans.*
k. All but the uppermost cauline leaf merely short-mucronate: involucre viscid-hirsute, with thick and firm bracts; the thick tips entire or merely crenulate.....8. *A. nitida.*
j. Indument of the rosette-leaves a loose tomentum: cauline leaves 5–10: inflorescence a corymb: corollas 3.8–5 mm. long *l.*
l. Flowering stems 3–7 cm. high, not glandular: the upper cauline leaves with oblong-lanceolate scarious appendages 2–3 mm. long: heads 2–5: involucre not glandular: achenes smooth..9. *A. Peasei.*
l. Flowering stems 0.5–1.5 dm. high, glandular-hirsute above: upper cauline leaves with subulate or involute tips: heads 3–9: involucre glandular-viscid: achenes papillose..10. *A. subviscosa.*
h. The 5–8 upper cauline leaves with broad flat scarious appendages: rosette-leaves mucronate: involucre (except for the whitish tips) fuscous, 6–8 mm. high, its bracts loosely spreading.....11. *A. isolepis.*
b. Larger basal leaves mostly wider (rarely less than 5 mm. wide), distinctly mucronate or apiculate *m.*
m. Rosette-leaves comparatively small, 0.2–2.1 cm. wide, with only the midrib prominent to the tip beneath, the lateral ribs short and evanescent *n.*
n. Middle and upper cauline leaves terminated by a flat or merely involute scarious appendage....*A. neglecta* Greene, *A. appendiculata* Fernald, *A. spathulata* Fernald, *A. canadensis* Greene.
n. Middle and upper cauline leaves subulate-tipped or mucronate, without a scarious appendage (except sometimes on the bracteal leaves of the inflorescence).....*A. petaloidea* Fernald, *A. glabrifolia* Fernald, *A. neodioica* Greene.
m. Rosette-leaves comparatively large, 0.7–5.5 cm. broad, with 3–7 somewhat prominent ribs beneath ..*A. plantaginifolia* (L.) Richardson, *A. occidentalis* Greene, *A. fallax* Greene, *A. Brainerdii* Fernald, *A. Parlinii* Fernald, *A. solitaria* Rydberg.

1. A. ALPINA (L.) Gaertn. FIG. 1. Humifuse, with trailing subligneous branches up to 1 dm. long: stolons short and crowded: *rosette-leaves* oblanceolate, *0.8–1.8 cm. long,* 1.5–4 mm. wide, *narrowed to a distinct subulate-mucronate tip,* bright green or canescent above: flowering stem slender, subflexuous, up to 2.3 dm. high: *cauline leaves* 4–13, becoming distant by elongation of the stem; *the middle and upper with oblong glabrous scarious tips:* pistillate heads 1–5, sessile or short-stalked: involucre 7–9 mm. high, lanate at base: bracts about 3-seriate, subequal; the outer lanceolate to oblong, fuscous, acuminate; the inner attenuate: *corollas 4–5 mm. long:* longer pappus-bristles 5–6 mm. long: achenes glabrous, 1.3–1.5 mm. long: *pits of*

the denuded receptacle 20–30, 0.3–0.4 mm. broad, much broader than the intermediate ridges.

Three varieties with us:

Flowering stems 2–12 cm. high, with 4–9 leaves: heads (when more than 1) in a close corymb or glomerule.
  Rosette-leaves green and glabrous above.....Var. *typica.*
  Rosette-leaves canescent-tomentose above.....Var. *canescens.*
Flowering stems elongating to 2–2.3 dm., with 9–13 leaves: rosette-leaves green and glabrous above: heads 1–2, the lower (when present) on a pedicel 1–1.5 cm. long .....Var. *ungavensis.*

Var. **typica.** *Gnaphalium alpinum* L. Sp. Pl. ii. 856 (1753). *A. alpina* (L.) Gaertn. Fruct. ii. 410 (1791).—Arctic America, south to Kangalaksiorvik Bay, Labrador (*Owen Bryant*) and mountains of British Columbia; also northern Eurasia. *Fl.* July–September.

Var. CANESCENS Lange, Fl. Dan. xvi. (fasc. xlvii.) 9, t. 2786, fig. 1 (1869); Fernald, RHODORA, xviii. 237 (1916). *A. angustata* Greene, Pittonia, iii. 284 (1898). Var. *cana* Fernald & Wiegand, RHODORA, xiii. 24 (1911), in part.—The commoner extreme in eastern America, extending south to Port Manvers, Labrador (*Delabarre*).

Var. UNGAVENSIS Fernald, RHODORA, xviii. 238 (1916).—Known only from the type-region, Stillwater River, Ungava District.

2. A. SORNBORGERI Fernald. FIG. 2. Humifuse, with trailing subligneous branches up to 1 dm. long: stolons very short and crowded: rosette-leaves oblanceolate, 6–12 mm. long, 1.5–2 mm. wide, narrowed at summit to the short-mucronate tip, canescent-pannose: *flowering stem stiffly erect*, 0.4–1.1 dm. high: *cauline leaves rather crowded*, 9–12, linear, 5–15 mm. long, 0.5–1.5 mm. wide; the *upper with villous lanceolate scarious tips:* pistillate heads 1–3, sessile, campanulate: involucre 6–7 cm. high, lanate at base: bracts about 3-seriate, subequal; the outer lanceolate, brown; the inner linear-attenuate, yellowish-brown, erose-serrulate: *corollas 3.5–4 mm. long:* longer pappus-bristles 4–5.5 mm. long: achenes glabrous, 1.2–1.4 mm. long: *pits of the denuded receptacle 60–100, 0.1 mm. broad, about as wide as the blunt-edged intermediate ridges.*—RHODORA, xviii. 237 (1916).—Rama, LABRADOR (*J. D. Sornborger*). *Fl.* August.

3. A. CANA (Fernald & Wiegand) Fernald. FIG. 3. Humifuse, the crowded leafy stolons very short (up to 2 cm. long): rosette-leaves narrowly cuneate-obovate or broadly oblanceolate, obtuse, not mucronate, broad-based, 3–11 mm. long, 2–5 mm. broad, white above with dense minute tomentum: flowering stems 2.5–12 cm. high, slender: *cauline leaves 9–15*, rather crowded, linear; the lower 8–15 mm. long, 1–2 mm. broad, subulate-tipped; *the median and upper subulate-tipped; only the uppermost with a lanceolate scarious tip:* pistillate heads (1–)2–6, campanulate, corymbose, on pedicels up to 1 cm. long: involucres 5–7 mm. high, lanate at base: bracts 3-seriate, subequal, very thin; the outer oblong, brown; the inner lanceolate, tawny, slightly fimbriate: *corollas 3.5–4 mm. long:* longest pappus

4–5.5 mm. long: achenes glabrous, 1.2–1.6 mm. long: *pits of the mature denuded receptacle 60–100, 0.1 mm. broad, much broader than the acute intermediate ridges*.—RHODORA, xviii. 236 (1916). *A. alpina*, var. *cana* Fernald & Wiegand, RHODORA, xiii. 24 (1911), in part.—Dry limestone barrens, western NEWFOUNDLAND. *Fl.* July, early August.

4. A. **vexillifera**, spec. nov. (FIG. 4), humifusa, stolonibus foliosis confertis perbrevibus (ad 2 cm. longis); foliis basalaribus late spathulatis vel cuneato-obovatis apice rotundatis vix mucronatis 5–12 mm. longis 3–4 mm. latis supra albidis, tomento denso minuto; caule florifero 6–10 cm. alto gracili; foliis caulinis 5–8 subdistantibus, imis oblanceolatis, mediis superioribusque linearibus 5–10 mm. longis cum apice scarioso oblongo-lanceolato 1.5–3 mm. longo munitis; capitulis femineis 1–5 corymbosis hemisphaerico-campanulatis basi rotundatis; involucro 6–7 mm. alto basi lanato; bracteis 2–3-seriatis subaequalibus tenuissimis, exterioribus anguste oblongis obtusis vel subacutis basi castaneis, interioribus lanceolatis fulvis plerumque acuminatis; corolla 3–4 mm. longa, lobis purpurascentibus; stylo purpurascenti; planta mascula ignota.—Matane County, QUEBEC: dry open gravel on the tableland-saddle (altitude about 1070 m.) between Mt. Mattaouisse and Mt. Collins, July 8, 1923, *M. L. Fernald, Ludlow Griscom, K. K. Mackenzie, A. S. Pease & L. B. Smith*, no. 26,056 (TYPE in Gray Herb.).

Closely simulating *A. cana* but at once distinguished by its cauline leaves. In *A. cana* these are 9–15, the median and upper ones tapering to a slender subulate tip, only the very uppermost with a scarious tip. In *A. vexillifera* the cauline leaves are fewer (5–8) and all but the very lowermost bear conspicuous broad pennant-like scarious tips (whence the specific name.)

A. vexillifera has the cauline leaf-tips of *A. alpina*, but that species has much narrower and distinctly mucronate basal leaves, larger heads with narrower and more fuscous involucral bracts and longer corollas (4–5 mm. long).

5. A. PYGMAEA Fernald. FIG. 5. Dwarf, *3–4.5 cm. high, monocephalous*, humifuse; the assurgent *stolons very short, not obviously elongated: basal leaves* oblanceolate, mucronate, 8–14 mm. long, 2.5–3.5 mm. wide, *glabrous or glabrate above; the cauline about 9, crowded*, linear-oblanceolate, 6–14 mm. long, lanate beneath, *glabrous or glabrate above, with a* lanceolate or narrowly deltoid *glabrous flat scarious tip* 1.5–2 mm. long: *pistillate involucre* hemispherical, 7 mm. high, 12–13 mm. broad (in the dried material), lanate at base: *bracts in about 5 series, definitely imbricated, oblong, obtuse;* the outer *fuscous*, with a short stramineous tip; the inner with a long obtuse stramineous tip: corollas 4 mm. long: staminate plant unknown.—RHODORA, xvi. 129

(1914).—Known only from northeastern Labrador[1] (*Weitz et al.*). *Fl.* August.

6. A. straminea Fernald. Fig. 8. Plant humifuse, the leafy stolons very short or slightly elongated (up to 7 cm. long): *leaves of the rosette spatulate,* subacute, *barely mucronate,* 5–12 mm. long, 2–4 mm. broad, *white above with dense fine tomentum: flowering stem* 3–14 cm. high, slender, *remotely leafy: cauline leaves* 8–10, linear, 6–14 mm. long, 1–2 mm. wide; the median attenuate to a dark subulate tip; *the upper with a linear scarious tip:* pistillate heads 1–7, usually in a close corymb, hemispheric-campanulate, rounded at base: involucre 5.5–7 mm. high, 4.5–8 mm. broad (in the dried specimens), *with 4–6 series of very distinctly imbricated bracts: the outer bracts ovate or oblong, brown,* slightly lanate at base, with a thin chartaceous stramineous obtuse or subacute tip; the median oblong, with a deltoid obtuse or subacute stramineous tip; the inner with a lanceolate erose stramineous tip: corollas 3.7–4.2 mm. long: achenes glabrous, 1.4 mm. long: longer pappus-bristles 4.5–5 mm. long: style yellowish, becoming brown: staminate plant unknown.—Rhodora, xvi. 130 (1914).—Rocky or turfy calcareous barrens and headlands bordering Notre Dame and Ingornachoix Bays, Newfoundland. *Fl.* July, early August.

7. A. albicans Fernald. Fig. 6. Plant humifuse, the leafy stolons very short (up to 2 cm. long): *basal leaves spatulate,* subacute or obtuse, *scarcely mucronate,* 3–8 mm. long, 2–3 mm. wide, *white above with dense minute somewhat shining tomentum:* flowering stem 4.5–9 cm. high, slender, somewhat remotely leafy: *cauline leaves* 9–15, linear, 6–12 mm. long, 1–2 mm. wide; the median attenuate, subulate at tip; *the upper with a glabrous linear scarious tip 2–2.5 mm. long:* pistillate heads (1–)2–5 in *glomerules,* turbinate-campanulate: *involucre*

[1] As noted when *A. pygmaea* was published, this is the plant which Gray in the *Synoptical Flora* treated as *A. carpathica* (Wahlenb,) R. Br.: "Labrador (a monocephalous form!)." But Gray, of course, was writing long before the intensive and highly productive studies of the genus had begun. *A. carpathica* belongs to the very strongly defined non-stoloniferous group of species with erect and elongate basal leaves (the section including *A. eucosma* Fernald & Wiegand, *A. pulcherrima* (Hook.) Greene, *A. lanata* (Hook.) Greene, etc.), while Gray's "monocephalous form" is a humifuse plant with depressed rosettes of tiny leaves. Dr. Theodor Holm, lamenting the disappearance of the name *A. carpathica* from American literature, cites Gray's record of the Labrador plant (*A. pygmaea*), which was not understood by Gray, as proof that *A. carpathica* does grow in America, though in Labrador it so far departs from the European type as to have only a single head (Rhodora, xxii. 142); and he reinforces his argument, that *A. carpathica* is North American, by the statement that, "Having examined a number of specimens of *A. lanata* Greene I find it impossible to distinguish them from *A. carpathica.*" I have before me 19 collections of *A. carpathica* of Europe and 26 of the Rocky Mountain *A. lanata.* In the former 2 to 4 of the median and upper cauline leaves end in a lance- or linear-subulate scarious tip, only 1 or 2 of the uppermost leaves ever showing dilated appendages; but in *A. lanata* 4 to 9 of the cauline leaves have broad and conspicuous pennant-like appendages. This perfectly obvious character, supplementing the broader leaves, the smaller heads, shorter corollas and shorter pappus, clearly distinguishes *A. lanata* from *A. carpathica* and it is doubtful if other students of *Antennaria* will follow Holm in forcing it and the wholly different *A. pygmaea* back into the European *A. carpathica.*

4.5–6 mm. high, 4.5–6 mm. wide (in dried specimens): *bracts* in 2–3 series, *subequal, thin;* the outer 3–4 mm. long, oblong or lanceolate, obtuse or subacute, straw-color or brown, green and a little lanate at base; *inner* oblong, obtuse, *lacerate-erose, milk-white:* corollas 3–3.3 mm. long: achenes glabrous, 0.8–1 mm. long: longer pappus-bristles 4–4.3 mm. long: staminate plant unknown.—RHODORA, xvi. 197 (1914).—Dry limestone shingle, northern domes of Table Mt., Port à Port Bay, NEWFOUNDLAND. *Fl.* July.

8. A. NITIDA Greene. FIG. 9. Resembling *A. albicans*. PISTILLATE PLANT with the stiffish stolons up to 6 dm. long: basal leaves 0.5–1.5 cm. long: flowering stems 0.5–2 dm. high: *cauline leaves 9–18; the middle and upper merely short-mucronate:* heads 5–9 in a glomerule: *involucre 6–7 mm. high, viscid-hirsute: bracts* about 4-seriate, *very unequal; the outer* 3–4.5 nm. long, oblong, obtuse, *whitish*, green and densely lanate at base; *the inner* white, gradually narrower, obtuse, *entire or barely erose:* corollas 3–3.5 mm. long: achenes 0.8–1.2 mm. long: longest pappus-bristles 5 nm. ong. STAMINATE PLANT with glomerules 1–2 cm. in diameter: involucre with firm creamy or yellowish oblong to obovate entire to merely crenulate bracts: corollas 3.5 mm. long: pappus 4–4.5 mm. long, upwardly barbellate; the slightly dilated (rarely broad) tips crenate.—Pittonia, iii. 283 (1898). *A. arida viscidula* E. Nelson, Proc. U. S. Nat. Mus. xxiii. 710 (1901). *A. viscidula* Rydberg, Fl. Colo. 369 (1906).—Dry limestone soil, Charlton Isl., James Bay, QUEBEC to ATHABASCA and UTAH. *Fl.* late June, July.

9. A. **Peasei**, spec. nov. (FIG. 11), humifusa, stolonibus foliosis confertis perbrevibus (ad 2 cm. longis); foliis basilaribus late oblanceolatis vel anguste cuneato-obovatis 7–12 mm. longis 2–4.5 mm. latis mucronatis supra albidis, tomento denso minuto; caule florifero 3–7 cm. alto gracili; foliis caulinis 5–7 lineari-lanceolatis 0.8–1.5 cm. longis, imis mediisque subulato-mucronatis, superioribus 2 vel 3 apice scarioso oblongo-lanceolato 2–3 mm. longo munitis capitulis femineis 2–5 dense corymbosis hemisphaerico-campanulatis basi rotundatis; invo ucro 6–7 mm. alto basi lanato; bracteis 2–3-seriatis subaequalibus chartaceo-petaloideis, exterioribus oblongis subacutis pallide brunneis basi subcastaneis, interioribus similibus acuminatis lacteis; corollis 3.8–5 mm. longis; stylo purpurascenti; achaeniis glabris; planta mascula ignota.—Matane County, QUEBEC: talus of mica-schist, chimney east of Razorback Ridge (altitude 850–1000 m.), Mt. Logan, July 13, 1923, *A. S. Pease & L. B. Smith*, no. 26057 (TYPE in Gray Herb.).

Related to *A. albicans* of western Newfoundland and *A. subviscosa* of Rimouski County, Quebec. From the former distinguished by the distinctly mucronate and loosely tomentose basal leaves, the few cauline leaves, the larger heads, the acuminate inner involucral bracts and the longer corolla; *A. subviscosa* is a coarser plant with trailing

branches often 4 or 5 dm. long. It has 7–9 cauline leaves, the uppermost with subulate or involute tips; its heads are more numerous (3–9) and its glandular-viscid involucres have more definitely imbricated bracts.

Various cordilleran species, *A. umbrinella* Rydberg, *A. pulvinata* Greene, etc., are related to *A. Peasei* but I am unable to find any species to which it can be satisfactorily referred.

10. A. SUBVISCOSA Fernald. FIG. 10. Plant densely humifuse, the *trailing branches subligneous*, often 4–5 dm. long; stolons very short and crowded: *leaves of the rosettes spatulate, obtusish, scarcely mucronate* or with a very short mucro, 0.5–1.5 cm. long, 2–5 mm. broad, densely white-tomentose: *flowering stems* 0.5–1.5 dm. high, white-tomentose throughout, *glandular-hirsute above: cauline leaves* 7–10, tomentose; the lower linear-oblanceolate, mucronate, 1.5–2.5 cm. long; *the upper* linear-attenuate, *with a subulate or involute subscarious pubescent tip:* pistillate heads 3–9, densely or loosely corymbose: *involucre* turbinate-campanulate, 5–6.5 mm. high: *bracts* about 3-seriate; *the outer* 3–4 mm. long, oblong, subherbaceous, greenish or stramineous, often rose-tinged, *glandular-viscid*, with a thin obtuse *cream-colored or rose-pink tip;* interior narrower, acutish: corollas 3.8–4.3 mm. long: *achenes papillose*, 1–1.2 mm. long: longer pappus-bristles 4.5–5 mm. long: staminate plant unknown.—RHODORA, XVI. 131 (1914).—Cold north-facing limestone sea-cliffs east of Bic, Rimouski Co., QUEBEC. *Fl.* July.

11. A. ISOLEPIS Greene. FIG. 7. Humifuse, the leafy stolons up to 7 cm. long: *rosette-leaves oblanceolate or obovate*, subacute or obtuse, *short mucronate, 0.8–2.5 cm. long, 2–7 mm. broad*, densely *white-tomentose* above: flowering stems 0.7–2.5 dm. high, flexuous: cauline *leaves 9–18*, linear-oblanceolate, tomentose, 1.5–3 cm. long, 2–4 mm. broad; the lower with subulate tips; *the 5–8 upper with broad flat scarious tips:* heads 5–9, corymbose: pistillate involucres 6–8 mm. high: *bracts of about 3 lengths, fuscous except for the oblong erose white or whitish widely spreading petal-like tips:* corollas 3–3.7 mm. long: *achenes sparingly papillose*, 1–1.2 mm. long: longest pappus-bristles 4.5–5.5 mm. long: staminate plant unknown.—Ottawa Nat. XXV. 41 (1911).—Coast of Hudson Strait, UNGAVA DISTRICT, and south near the outer coast at least to Port Manvers, LABRADOR. *Fl.* July, August.

EXPLANATION OF PLATE 142.

FIG. 1, *Antennaria alpina* × 1; 1a, tip of median cauline leaf × 4. FIG. 2, *A. Sornborgeri* × 1; 2a, tip of median cauline leaf × 4. FIG. 3, *A. cana* × 1; 3a, tip of median cauline leaf × 4. FIG. 4, *A. vexillifera* × 1; 4a, tip of median cauline leaf × 4. FIG. 5, *A. pygmaea* × 1; 5a, tip of median cauline leaf × 4. FIG. 6, *A. albicans* × 1; 6a, tip of median cauline leaf × 4; 6b, inner bract of involucre × 4. FIG. 7, *A. isolepis* × 1; 7a, tip of median cauline leaf × 4. FIG. 8, *A. straminea* × 1; 8a, tip of median cauline leaf × 4. FIG. 9, *A. nitida* × 1; 9a, tip of median cauline leaf × 4; 9b, inner bract of involucre of staminate plant × 4. FIG. 10, *A. subviscosa* × 1; 10a, tip of median cauline leaf × 4; 10c, central flower and achene × 4. FIG. 11, *A. Peasei* × 1; 11a, tip of median cauline leaf × 4; 11c, central flower and achene × 4.

III. THE EASTERN AMERICAN REPRESENTATIVES OF ARNICA ALPINA.

(Plate 143.)

In 1905 I published[1] a synopsis of the species of *Arnica* known in northeastern America and at that time predicted that "doubtless many other species will be found, especially on the mountains and cliffs of eastern Quebec." Although the prediction has not yet been wholly fulfilled, two very distinct new species have been discovered, one on the Long Range of western Newfoundland, the other in the Shickshock Mountains. In determining the exact relationships of one of these plants, discovered in 1923 on Mt. Logan and the neighboring Mt. Mattaouisse in Matane County, Quebec, it has seemed appropriate to present a new treatment of the eastern species with few and small cauline leaves and with white and merely barbellate pappus (*A. alpina* and its allies) and to publish Miss Brackett's drawings of these species. In order to show the contrast between these plants and the well known *A. mollis* Hook. of the Rocky Mountains and of the Gaspé Peninsula and of northern New England and northern New York, the latter species is also included in the key, although it seems unnecessary to discuss it in detail.

a. Stem-leaves 1–4 pairs (sometimes scattered small bracts above), at least the upper entire or only sparingly toothed: pappus white or whitish; its bristles merely barbellate *b.*
  b. Achenes copiously hirsute from base to summit *c.*
    c. Lower leaves entire or with only remote irregular teeth *d.*
      d. Base of involucre and summit of peduncle villous-lanate *e.*
        e. Leaves nearly glabrous or only minutely glandular-hispid: involucral bracts 15–20, narrowly lanceolate, 2–3 mm. broad, only sparingly pubescent above the middle: ligules with blunt lobes only 1–2 mm. long.....1. ***A. alpina.***
        e. Leaves loosely villous: involucral bracts 8–10, narrowly rhombic, 3–3.5 mm. broad, loosely villous to the tip: ligules with acutish lobes 3–5 mm. long.....2. *A. pulchella.*
      d. Base of involucre and summit of peduncle viscid-villous but hardly lanate *f.*
        f. Leaves glabrous or merely minutely pilose on nerves and margin, entire; the cauline lanceolate to oblong: stem glabrous or essentially so at base: involucral bracts oblanceolate, 1 cm. long, glandular-villous at base, only sparingly pilose or glabrate above: ligules with blunt lobes only 1–2 mm. long.....3. *A. plantaginea.*
        f. Leaves glandular-puberulent and viscid-villous, irregularly dentate; the cauline linear or linear-

[1] Rhodora, vii. 146–150 (1905).

lanceolate: stems viscid-villous at base: involucral bracts linear- to lance-attenuate, 1.2–1.5 cm. long, uniformly viscid-villous: ligules with acutish lobes 3–5 mm. long.....4. *A. Sornborgeri.*

c. Lower leaves regularly dentate *g.*

g. Disk-corollas 6–8 mm. long, with glabrous or only sparingly setose lobes; the densely pilose portion of the tube and throat 3.5–6 mm. long: mature pappus 5–8 mm. long, bright-white.....5. *A. chionopappa.*

g. Disk-corollas 9–10 mm. long, with copiously setose lobes; the densely pilose portion of the tube and throat 7–9 mm. long: mature pappus 9–10 mm. long, creamy-white.....6. *A. gaspensis.*

b. Achenes glabrous or nearly so below the middle.....7. *A. Griscomi.*

a. Stem-leaves 3–5 pairs, all evenly dentate: pappus yellowish-brown or olive-tinged; its bristles subplumose.....8. *A. mollis.*

1. A. ALPINA Olin & Ladau. FIG. 1. *Stem* 0.5–3 dm. high, *sparingly short-villous below,* densely so above, copiously villous-lanate at tip: *leaves nearly glabrous or minutely glandular hispid;* the basal linear-lanceolate, 3–9 cm. long, 0.4–1.6 cm. broad, entire or with few remote small teeth; cauline 1–3 pairs, entire, sessile, the lowest usually much longer than the reduced upper ones: heads solitary (rarely 2–4), 4–6 cm. broad: *involucre densely villous-lanate at base; its 15–20 narrowly lanceolate* long-acuminate usually purplish *bracts only sparingly pubescent above the middle,* 1.2–1.5 cm. long, *2–3 mm. broad: ligules 10–15, with 3 blunt lobes 1–2 mm. long:* achenes hirsute: pappus cream-white; its bristles barbellate.—Diss. 11 (1799), acc. to Ind. Kew. *A. montana, β alpina* L. Sp. Pl. ii. 884 (1753). *A. angustifolia* Vahl, Fl. Dan. ix. t. 1524 (1818).—Arctic regions, south to rocky slopes of the Torngat Mts., Labrador, Mosquito Bay, Ungava Distr., northern Manitoba, and Alaska; arctic and alpine Eurasia. *Fl.* August.

2. A. PULCHELLA Fernald. FIG. 2. *Stem* 1–1.8 dm. high, *villous,* especially above, *with white hairs 1–2 mm. long* mixed with minute stipitate glands: *leaves loosely villous* on both surfaces; the basal lanceolate or oblanceolate, 3–15 cm. long, 0.5–1.5 cm. broad, entire or remotely callous-dentate; cauline 1–2 pairs, entire: head solitary, 4.5 cm. broad: *involucre densely villous-lanate at base; its 8–10 narrowly rhombic* long-attenuate *bracts* glandular and *loosely villous to the tip,* 1.5 cm. long, *3–3.5 mm. broad: ligules* about 10, *with 3–4 sharp lobes* (*the longest 3–5 mm. long*): achenes hirsute: pappus white, barbellate.—RHODORA, xvii. 18 (1915).—Dry exposed limestone ledges and shingle, Table Mt., Port à Port Bay, Newfoundland. *Fl.* July.

3. A. PLANTAGINEA Pursh. FIG. 4. *Stem 1.5–4.5 dm. high, glabrous or only very sparingly villous-hispid below,* glandular-puberulent at summit: *leaves glabrous or minutely pilose on the nerves and margins, entire; the basal oblong to oblanceolate,* 0.6–1 dm. long, 1.2–2 cm. broad; cauline 3–4 pairs, sessile, the lower 7–13 cm. long, the upper much reduced: heads 1–3, 4–5 cm. broad: *involucre* glandular-villous at

base; *its 10–12 oblanceolate bracts 1 cm. long, sparingly pilose or glabrate above the base: ligules* 10–15, *with 3 blunt lobes 1–2 mm. long:* achenes hispid: pappus white, barbellate.—Fl. 527 (1814); Fernald, RHODORA, vii. 147 (1905). *A. angustifolia* Torr. & Gray, Fl. ii. 449 (1843), in part, not Vahl. *A. alpina* Gray, Syn. Fl. i. pt. 2: 382 (1886), in part, not Olin & Ladau. *A. alpina,* var. *Lessingii* Fernald & Sornborger, Ott. Nat. xiii. 106 (1899), in part, not Gray.—Banks of mountain-brooks, etc., Ramah to Nain, Labrador, west to Kooksoak River, Ungava District. *Fl.* August.

4. A. SORNBORGERI Fernald. FIG. 3. *Stem* 1.5–2 dm. high, *viscid-villous throughout,* densely so at summit: *leaves glandular-puberulent and viscid-villous, irregularly dentate;* the basal linear-lanceolate to narrowly oblong, 6–9 cm. long, 0.8–1.6 cm. broad; cauline 3 pairs, linear to lanceolate: head solitary, 4.5–6 cm. broad: *involucre uniformly viscid-villous throughout; its 10–12 linear- to lance-attenuate bracts 1.2–1.5 cm. long: ligules* 10–15, *with acutish lobes 3–5 mm. long:* achenes hirsute: pappus white, barbellate.—RHODORA, vii. 147 (1905).—Rocky banks of streams, Torngat Mts., Labrador. *Fl.* August, September.

5. A. CHIONOPAPPA Fernald. FIG. 5. *Stem* 0.7–4 dm. high, *loosely or sparingly villous: leaves sparingly villous or glabrate; the basal* lanceolate to narrowly ovate, *regularly dentate,* 0.3–1.8 dm. long, 0.5–3.3 cm. broad; cauline 2–4 pairs, the lower slender-petioled and resembling the basal, the upper sessile and much smaller: heads 1–4, 3–4 cm. broad: *involucre villous throughout; the 10–15 linear- to lance-attenuate bracts 7–13 mm. long:* ligules 10–15, with short bluntish lobes: *disk-corollas 6–8 mm. long,* with glabrous or only sparingly setulose lobes; *the densely pilose portion of the tube and throat 3.5–6 mm. long: achenes* densely short-setulose, 4–6 mm. long; the ascending *white hairs about equaling one-half the diameter of the achene: pappus bright-white, in fruit 5–8 mm. long.*—RHODORA, vii. 148 (1905).—Calcareous ledges, shingle, cliffs and river-gorges, Table Mt., Port à Port Bay, Newfoundland; Cap-Rosier, Gaspé Co., Quebec to the Tobique River, New Brunswick. *Fl.* late June–ear y August.

6. A. GASPENSIS Fernald. FIG. 6. *Stem* 3–4 dm. high, villous below, *glandular-puberulent above: leaves sparingly pilose on both surfaces,* lanceolate; the lower with sharp spreading teeth, 6–12 cm. long, 1.2–2.3 cm. broad; the 3 or 4 pairs of cauline sessile, the upper much reduced: heads 1–4, 4–5 cm. broad: *involucre glandular puberulent and sparingly pilose; its 8–10 oblong bracts* 1 cm. long, *with triangular tips: ligules* about 10, *sharply lobed: disk-corollas slenderly funnelform, 9–10 mm. long, with copiously setose lobes; the densely pilose portion of the tube and throat 7–9 mm. long:* achenes hirsute with short and *long hairs, the latter nearly equaling the diameter of the achene: pappus cream-white, in fruit 9–10 mm. long.*—RHODORA, vii. 148 (1905).—Calcareous ledges and cliffs, Cap Tourelle, Gaspé Co., Quebec. *Fl.* July.

7. A. **Griscomi,** n. sp. (FIG. 7), rhizomate gracili 0.4–1 dm. longo

horizontali vel oblique adscendente; caule solitario (rarissime 2–3) piloso supra sparse villoso-hirsuto 0.8–2.5 dm. alto; foliis rosulatis lanceolato-ellipticis 3–10 cm. longis 0.5–2 cm. latis subacuminatis basi angustis plus minusve petiolatis supra papillosis vel sparsissime villosis glabratisque ciliatis margine calloso-serratis, dentibus 3–7-jugis; foliis caulinis 1–2-jugis, inferioribus oblanceolatis vel oblongis vel lanceolato-ovatis remote serratis vel integris glabris vel papillosis, superioribus valde reductis apice calloso-subulatis; pedunculis 1–3 nudis vel bracteolatis, bracteolis linearibus apice subulati-filiformibus; capitulis 2.5–4 cm. diametro; involucro 1–1.5 cm. alto basi minute piloso supra glabro; bracteis 8–10 anguste rhomboideis 2–3 mm. latis acuminatis ciliatis dorso glabris, paginis interioribus apice villosis; ligulis 9–12 luteis, lamina 1–1.5 cm. longa 4–5 mm. lata 7–9-nervata apice 3-dentata, dentibus longioribus 0.5–1 mm. longis; corollis disci 6–7 mm. longis, tubo villoso 2.5–3.5 mm. longo; achaeniis 3–3.5 mm. longis glabris vel ad apicem sparse breviterque hirsutis; pappo 6–7 mm. longo albo, setis barbellulatis.—Matane County, QUEBEC: moist rock-walls and shelves of hornblende-schist at head (altitude about 1070 m.) of Big Chimney, Mt. Mattaouisse, July 8, 1923, *M. L. Fernald, Ludlow Griscom, K. K. Mackenzie, A. S. Pease & L. B. Smith*, no. 26,082; same station, August 20, 1923, *Fernald & Smith*, no. 26,085; dry schistose crests and talus of Razorback Ridge (altitude 850–1000 m.), Mt Logan, July 13, 1923, *Pease & Smith*, no. 26,083; cold chimneys in the schist at about 900–1000 m. altitude, south of Fernald Pass, Mt. Mattaouisse, August 20, 1923, *Fernald & Smith*, no. 26,084 (TYPE in Gray Herb.).

Named for Ludlow Griscom, professional ornithologist, keen amateur botanist, tireless explorer and choice companion, who first discovered the plant which subsequently proved to be somewhat generally distributed on the cold walls of Mts. Mattaouisse and Logan.

Arnica Griscomi belongs to the group of species nearly related to *A. alpina*. From all of them it is distinguished by its achenes being glabrous at base or often nearly throughout; *A. alpina*, *A. plantaginea*, *A. chionopappa*, *A. gaspensis* and *A. arnoglossa* Greene, the five species to which it is most nearly related, having the achenes densely hirsute with comparatively long trichomes. In *A. alpina*, furthermore, the entire basal leaves are very narrow, and the involucre is densely lanate at base and it has more numerous and narrower bracts. *A. chionopappa* has the more numerous linear- or lance-attenuate bracts villous throughout, the ligules more numerous, the villous portion of the disk-corolla longer, and the achenes longer; *A. plantaginea* has the stem glabrous or essentially so at base but distinctly glandular above and its leaves are entire; *A. gaspensis* (which is

A. E. Brackett del.

DWARF ANTENNARIAS.

A. E. Brackett del.

REPRESENTATIVES OF ARNICA ALPINA.

known only at the type-station where it has thrice been collected) has the involucral bracts glandular as well as pilose, its disk-corollas slender and longer than in others of the group and with the villous tube more than twice as long as in *A. Griscomi*, its achenes nearly twice as long and its pappus creamy- or sordid-white instead of snow-white. *A. arnoglossa*, described from the Black Hills, is densely glandular-puberulent above and the very young achenes (the only ones seen) are definitely longer than the mature ones of *A. Griscomi*.

Explanation of Plate 143.

Fig. 1, *Arnica alpina* × 1; 1a, disk-flowered × 4; 1b, tip of ligule × 4 Fig. 2, *A. pulchella* × 1; 2b, tip of ligule × 4. Fig. 3, head of *A. Sornborgeri* × 1. Fig. 4, *A. plantaginea* × 1. Fig. 5, *A. chionopappa* × 1; 5a, disk-flower × 4. Fig. 6a, disk-flower of *A. gaspensis* × 4. Fig. 7, *A. Griscomi* × 4; 7a, disk-flower × 4.

(To be continued)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—New Series.—No. LXXII.

(*Continued from page 108.*)

IV. SOME SENECIOS OF EASTERN QUEBEC AND NEWFOUNDLAND.

(Plate 144.)

Senecio resedifolius.—In 1818 Ledebour described from the Altai of Siberia a monocephalous Senecio under the name *Cineraria lyrata*.[1] The plant was subsequently collected by Bunge, Fischer, Tiling, Turczaninow, Charles Wright and others in the Altai and Baikal regions or at other points in Siberia eastward to Amur and the coast of Bering Straits. It is a well marked but highly variable plant, a single variation of which was illustrated in Reichenbach's *Iconagraphia*.[2] In 1831 Lessing gave a beautifully detailed description of one of Chamisso's plants from Bay St. Lawrence or Gulf of St. Lawrence on the Asiatic side of Bering Straits as *Senecio resedifolius*,[3] and as a syncnym he cited *Cineraria lyrata* Less., Lessing's specific name being unavailable on account of the older *Senecio lyratus* L. f.

Gradually the knowledge of *Senecio resedifolius* was extended until, in 1867, Herder[4] recognized it as a wide-ranging species, extend-

[1] Ledeb. Mém. Acad. Pétersb. v. 576 (1818).

[2] Reichenb. Ic. Bot. Crit. ii. 1, t. 101 (1824).

[3] Lessing, Linnaea, vi. 243 (1831). Lessing's account says clearly that the original habitat was "In sinu St. Laurentii cel. de Chamisso" and one of the original labels in Chamisso's hand, in the Gray Herbarium, is equally explicit: "Sin. St. Laurent." This, of course, is the well known Bay or Gulf of St. Lawrence on the west side of Bering Straits, where many types were collected by Chamisso. Greenman in his monograph (Ann. Mo Bot. Gard. iii. 99) erroneously cites the Chamisso material as coming from "Alaska: St. Lawrence Island, *Chamisso.*"

[4] Herder, Reisen in den Süden von Ostsibirien, iii. Heft. 2: 116 (1867).

ing from Bering Straits across arctic Siberia and south to the Altai, and along the coast of Alaska to "Brittisch Nord-Amerika." In 1916 its range, as understood by the monographer of the genus, Greenman,[1] was essentially the same, he citing specimens from as far south as the Aleutian and Shumagin Islands and "Mucklung River" (supposed to be in British Columbia). At the same time *Senecio Fernaldii* Greenman,[2] from a spur of the Long Range in Newfoundland, was described as a new species. The type of the latter was a single rather exceptional individual,[3] but it showed characters in the foliage and in its lack of ligules which seemed to separate it from the ordinarily radiate *S. resedifolius*. Subsequently, however, the Newfoundland plant (figs. 1[3] and 1[4]) has been twice collected in quantity at the type-locality, in July, 1914 (*Fernald & St. John*, no. 10,873) and in July, 1921 (*Mackenzie & Griscom*, no. 10,483). A few individuals of these later collections are good matches for the type; but of the 47 plants of these two collections preserved in the Gray Herbarium all but these half-dozen individuals show such departures in the toothing and shape of the basal leaves, development and cutting of the cauline leaves, and development of ligules that, by those who have not seen them growing in one area of limestone shingle, and who might depend too reliantly upon the key-characters used by Greenman, "heads . . . discoid," and "Lower leaves sharply dentate," they might readily be mistaken for several species. The basal leaves may be sharply dentate, rounded-dentate or shallowly undulate, oblanceolate, rhombic, elliptic, orbicular or reniform, and at base from narrowly cuneate to cordate. The middle and upper cauline leaves likewise vary from linear- or lance-attenuate to deltoid and from entire to pinnatifid; and the heads are either discoid or radiate. *S. Fernaldii*, growing as it does upon a dry exposed limestone tableland without shelter from wind and brilliant light, is a dwarf plant with strong tendency to purple coloring in leaves and involucre, and in all these features, as well as in its disk-flowers, the individuals with crenate-dentate basal leaves seem quite inseparable from Chamisso's original material from the west side of Bering Strait of *S. resedifolius*,

[1] Greenman, Ann. Mo. Bot. Gard. iii. 99 (1916).

[2] Greenman, l. c. 90 (1916).

[3] "but after we had repeatedly made solemn vows to look at nothing else and were finally hastening back across the barren in order to reach the settlement before dark, an unusual appearing Senecio came riding down a mass of sliding gravel to my very feet. This was too great a temptation, so I snatched the plant as it was sliding past." —Fernald, Rhodora, xiii. 131 (1911).

while others are inseparable in foliage, involucre and disk-corollas from material collected by Charles Wright on Arakamtchetchene Island in Bering Straits or by Blaisdell at Cape Nome; while taller and looser-growing individuals are almost identical with Weinmann's specimens from the Kuskokwim Valley in Alaska. The only difference I can make out is that the material from about Bering Sea usually has well developed rays; the Newfoundland plant is usually discoid, though occasionally with short ligules; but the ligules of the Chamisso material are nearly as short as in the radiate plants from Newfoundland, while *S. resedifolius*, var. *columbiensis* Gray is a lax and luxuriant shade-form separated because of its rayless heads. I am, therefore, unable to find any stable characters by which *S. Fernaldii* can be maintained as specifically distinct from *S. resedifolius*.

During the summer of 1923, the party[1] exploring the schistose mountains centering on Mt. Logan in Matane County, Quebec, found a very handsome Senecio with large commonly solitary and radiate heads. This plant (figs. 1^1, 1^2 and 1a), which abounds in turfy chimneys and upon cliffs and talus at altitudes of 850–1150 m. on Mts. Fortin, Logan and Pembroke, and which in its well developed green leaves (basal leaves up to 3 cm. broad, cauline leaves in luxuriant plants up to 8 cm. long and 3.5 cm. broad), tall stature (often 2–3 dm.) and showy elongate ligules, did not suggest in the field the little purplish plant of the dry barrens of western Newfoundland already discussed; but at one station, the dry upper talus and cliffs at the head of Hanging Valley on Mt. Pembroke, plants clearly conspecific with the large-leaved specimens of the moister chimneys had the low stature, reduced foliage and occasionally the discoid heads of the Newfoundland plant. Altogether the plant of the Shickshock Mts. shows almost every conceivable variation, even for so protean a group as *Senecio*, and in this series collected at three closely adjacent stations all the recorded variations of *S. resedifolius* can be matched.

The variation of *S. resedifolius* which was described by Ledebour from the Altai as *Cineraria lyrata* is so much taller and has so much better-developed basal leaves than Chamisso's plant that it has been treated by DeCandolle, Herder and others as a distinct variety, var. *lyratus* (Ledeb.) DC., supposed to be confined to the Altai and Baikal region; but some of the individuals from the Shickshock Mts. are

[1] J. F. Collins, C. W. Dodge, M. L. Fernald, Ludlow Griscom, K. K. Mackenzie, A. S. Pease and L. B. Smith.

scarcely distinguishable from authentic Altai and Baikal material, except in their slightly shorter and broader rays. Others again closely match in their angulate-toothed leaves Tiling's original specimens from Ajan (on the west side of Ochotsk Sea) of var. *multicaulis* Herder; while others have the cauline leaves even more developed than in the type of var. *columbiensis*.

In the Newfoundland plant the unexpanded disk-corollas and the outsides of the lobes are deep orange, in the Shickshock plant usually orange-yellow; but in the latter region a single individual was found with both disk- and ray-flowers decidedly reddish. And, as already noted, in the plants of Newfoundland the heads are commonly discoid but sometimes radiate, while in the Shickshock area they are commonly radiate but occasionally discoid. Exactly the same variations of the heads are found in Siberia, Ledebour explicitly saying in his description: "Capitula majora v. minora, saepissime radiata nec nisi rarissime discoidea. Ligulae plerumque aureae variant flavae et licet rarissime rubicundae."[1] In brief, *Senecio resedifolius*, long supposed to be restricted to the region from Alaska across Siberia, is now known in two extremely isolated regions, the Shickshock Mountains of Gaspé and the Long Range of Newfoundland, where in its numerous modifications it not only parallels but seems to exceed the Alaskan and Siberian plant. Miss Brackett's drawings (fig. 1) show only a few of the variations in eastern America.

SENECIO PAUCIFLORUS AND S. INDECORUS.—Two of the most characteristic species of *Senecio* on the Gaspé Peninsula are strikingly different plants which, in his *Monograph of the North and Central American Species of the Genus Senecio*, are treated by Greenman[2] as a single species, *S. pauciflorus* Pursh. One of the plants, true *S. pauciflorus* (fig. 2), is in eastern Quebec confined to the alpine and subalpine chimneys and meadows of the Shickshock Mts. and to the calcareous terraces bordering the Straits of Belle Isle. North of the Straits of Belle Isle it is characteristic of the mountainous region from Cape Mugford to the northern limits of Labrador, while in western America it extends from near the Arctic Circle in Mackenzie, Yukon and Alaska to the mountains of Wyoming and the Yosemite region of California. In the field *S. pauciflorus* is at once distinguished by its thick and fleshy foliage, the few cauline leaves with blunt teeth

[1] Ledebour, Fl. Ross. ii. 632 (1844–46).
[2] Greenm. Ann. Mo. Bot. Gard. iii. 91 (1916).

and lobes; by its comparatively low stature (1 to rarely 5.5 dm.), few (1–6, more rarely –11) broadly campanulate heads with usually purple involucres, and disk-corollas with orange-red or deep-red lobes.

The other species (fig. 3) is the plant figured and described in Britton & Brown, Illustrated Flora, iii. 479, fig. 4042, as *S. discoideus*.[1] This plant should, however, be called *S. indecorus* Greene, since Hooker's *S. aureus*, δ *discoideus*, upon which *S. discoideus* rests, proves to be *S. pauciflorus*. Unlike *S. pauciflorus*, *S. indecorus* is not an arctic-alpine plant, but it occurs in the Canadian forest at low levels, from Gaspé County, Quebec to the Lake Superior region and at comparatively low altitudes from southern British Columbia to Idaho and northeastern California. In Quebec, where I have been familiar with the two species for twenty years, *S. indecorus* occurs in thickets and woodland-swamps or on talus and cool ledges of limestone; and in the field it is at once distinguished from the alpine and subalpine *S. pauciflorus* by its thin or membranaceous basal leaves sharply lacerate-pinnatifid and rather numerous cauline leaves, tall stature (up to 9 dm.), more numerous (6–40) slenderly cylindric-urceolate heads with green or merely purple-tipped involucres and yellow flowers.

In *S. indecorus* the filiform tube of the corolla is 3.6–6 mm. long, in *S. pauciflorus* only 3–4 mm.; and in the former the slender, strongly costate achenes (fig. 3d) are 2–3 mm. long, the plumper, less prominently ribbed and darker achenes of *S. pauciflorus* (fig. 2d) being 3–3.5 mm. long. When the heads are quite mature the bracts of the involucre of *S. pauciflorus* (fig. 2c) spread or become only slightly reflexed, exposing a smooth and nearly flat denuded receptacle (fig. 2b), but in *S. indecorus* the mature and narrower bracts (fig. 3c) become strictly reflexed and the convex receptacle (fig. 3b) is conspicuously alveolate, the walls of the pits very thin and jagged or almost fimbriate.

Although the heads of *S. indecorus* are normally discoid, they, like those of *S. pauciflorus*, are sometimes radiate and plants of both forms sometimes occur in the same colonies.[2] These radiate individuals

[1] *S. discoideus* Hook. ex Torr. & Gray, Fl. ii. 442 (1843) is usually cited as *S. discoideus* (Hook.) Britton. l. c. (1898), but the combination was actually published and ascribed to Hooker in 1843.

[2] The character, "discoid" or "radiate," is very unsatisfactory in *Senecio*. In the species of northeastern America the ordinarily radiate *S. aureus* L., *S. Robbinsii* Oakes, *S. pauperculus* Michx., *S. oboratus* Muhl. and *S. resedifolius* Less., in addition to those above discussed, are occasionally discoid.

which occur in Quebec side-by-side with the commoner discoid form of *S. indecorus* are quite inseparable from the type from Idaho and other authentic specimens from British Columbia of *S. Burkei* Greenman, Ott. Nat. xxv. 114 (1911) and Ann. Mo. Bot. Gard. ii. 626, t. 20, fig. 1 (1915); and it is significant that many of the British Columbian localities for discoid *S. indecorus* are identical with those cited by Greenman for *S. Burkei.*

In the development of its foliage *S. indecorus* varies as much as *S. pauciflorus, S. aureus, S. pauperculus* and *S. resedifolius,* the plants showing quick responses to degrees of moisture, exposure and soil-fertility. In different habitats of the same region may be collected specimens with greatly reduced cauline leaves and others with them remarkably dilated. Plants of the latter extreme from Rimouski County, Quebec, are quite inseparable from *S. idahoensis* Rydberg, Bull. Torr. Bot. Cl. xxvii. 183, t. 6, fig. 5 (1900), which Greenman recognizes as a species distinct from *S. pauciflorus. S. idahoensis* has all the technical characters of *S. indecorus,*—membranaceous basal leaves, laccrate-pinnatifid cauline ones, tall stature, numerous heads, slender green involucre, characteristic corolla and achene, and the alveolate receptacle—and the type-number is, except for lack of ligules, a good match for the type of *S. Burkei.* None of the characters of disk-corolla, achene and receptacle are mentioned by those who maintain the distinctness of *S. idahoensis;* but the plant is considered remarkable in having the "stem branched from near the base" and "large broad stem-leaves" (Greenman, Ann. Mo. Bot. Gard. iii. 96). The foliage of the type-number, *Sandberg, MacDougal & Heller,* no. 803, is, as already implied, closely matched by that of luxuriant individuals from eastern Quebec and by the type of *S. Burkei;* but, as shown by the sheet of the type-number of *S. idahoensis* in the Gray Herbarium (one of the sheets cited by Greenman), the basal branching of this Idaho specimen is due to the fact that the primary stem had been broken or bitten off, causing the development of few-headed basal branches.

The type of *Senecio discoideus* is Hooker's *S. aureus,* δ *discoideus* from Fort Franklin in Mackenzie. An excellent photograph of Hooker's type is preserved at the Field Museum of Natural History and I am under obligation to Messrs D. C. Davies and J. Francis Macbride for an opportunity to examine it. It is certainly not the plant (*S. indecorus*) which has been passing as *S. discoideus* in eastern

America. In the lobing of its leaves the type of *S. discoideus* is like *S. pauciflorus*, but it has broadly deltoid instead of oblong cauline leaves and much more numerous heads than in the typical *S. pauciflorus* of Labrador and Quebec. Material from British Columbia closely approaches the Fort Franklin plant, however, and *S. discoideus* is best treated as an extreme development of *S. pauciflorus*.

Greene's description of *S. indecorus* at once suggests the plant which has been passing as *S. discoideus* and a beautiful photograph of the type which has been generously furnished me by Professor George W. Albertson of the University of Notre Dame settles beyond question this identity.

Briefly summarized the main characters and the bibliography of *S. pauciflorus* and *S. indecorus* are stated below, and a few characteristic specimens are cited.

S. PAUCIFLORUS Pursh, Fl. Am. Sept. ii. 529 (1814); Greenman, Ann. Mo. Bot. Gard. iii. 91 (1916), in part. *S. aureus*, δ *discoideus* Hook. Fl. Bor. Am. i. 333 (1834). *S. discoideus* Hook. ex Torr. & Gray, Fl. N. A. ii. 442 (1843), as to type but not description. *S. aureus*, γ *borealis* Torr. & Gr. Fl. N. A. l. c. (1843), in part. *S. Lemberti* Greene, Pittonia, iii. 89 (1896). *S. aureus pauciflorus* (Pursh) Britton in Britton & Brown, Ill. Fl. iii. 480 (1898).—Stems rather stout, 1–5.5 dm. high: leaves thick and fleshy; the basal long-petioled, elliptic to reniform, cuneate to cordate at base, coarsely dentate; the median and upper sessile, 2–5 below the inflorescence, lanceolate, oblong or oblanceolate, with mostly obtuse lobes and coarse teeth: heads 1–6, rarely –11, broadly campanulate, usually discoid; involucres usually purple; the blunt to acute bracts 1–2 mm. broad: corollas with filiform tube 3–4 mm. long; the lobes orange-red to deep-red: achenes dark red-brown, plump, 3–3.5 mm. long: mature involucre rotate or oosely reflexed; denuded receptacle smooth and nearly flat.—Calcareous meadows, alpine slopes and wet rocks, northern Labrador to Matane County, Quebec; Mackenzie, Yukon and Alaska to Wyoming and California. The following are in the Gray Herbarium. LABRADOR: hills back of Okkak, *Moravian Brothers*, August, 1911, *F. C. Hinckley;* Hebron, *Moravian Brothers;* Rama, July, 1894, *J. D. Sornborger*, August, 20–24, 1897, *Sornborger*, no. 67; Mugford, August 14, 1900, *Delabarre;* barrens, Forteau, July 30, 1910, *Fernald & Wiegand*, no. 4172; wet mossy spots, limestone and calcareous sandstone terraces, Blanc Sablon, August 2, 1910, *Fernald & Wiegand*, no. 4173. QUEBEC: shore of Seal Lake, Ungava, August 3, 1896, *Spreadborough*, no. 14,387 in part; little swales near summit of limy ridge, Pointe Jones, Brest, Saguenay Co., July 29, 1915, *St. John*, no. 90,779; alpine and subalpine meadows and calcareous walls, altitude 1000–1200 m., Tabletop Mts., Gaspé Co., many collections in August of

1906 and 1923, *Fernald & Collins*, nos. 261, 263, *Fernald, Dodge & Smith*, nos. 26,109, 26,110; wet hornblende-schist at base of Big Chimney, north slope of Mt. Mattaouisse (called on label "Mt. Logan"), Matane Co., July 22, 1922, *Fernald & Pease*, no. 25,341; schistose talus and wet shelves at base (altitude 400–600 m.) of Big Chimney, Mt. Mattaouisse, July 10, 1923, *Dodge, Griscom & Pease*, no. 26,106; moist rocks and turfy chimneys (alt. about 800–1050 m.), Pease Basin, between Mts. Logan and Pembroke, Matane Co , July 13, 1923, *Pease & Smith*, no. 26,107; moist bushy ta'us and mouths of chimneys at about 900–1125 m. alt., Hanging Valley, Mt. Pembroke, July 16, 1923, *Griscom & Pease*, no. 26,108, August 24, 1923, *Fernald & Smi h*, no. 26,111. MACKENZIE: Fort Franklin, *Richardson* (tracing from photograph of *S. aureus* δ *discoideus* Hook.). ALBERTA: Flatts, junction of North Fork and West Branch of Saskatchewan, June 21, 1908, *S. Brown*, no. 1008; Malique Lake, July 8 and 18, 1908, *Brown*, nos. 1173, 1247; Blind Valley and Lakes, alt. 7000–8000 ft., July 6, 1906, *Brown*, no. 414. BRITISH COLUMBIA: below Pipestone summit, July 6, 1904, *J. Macoun*, no. 65,018; upper Spillamacheen Valley, alt 6500 ft., August 3, 1904, *C. H. Shaw*, no. 440; Cornwall Hills, July 28,—*J. McEvoy*, no. 5100; Alberni, Vancouver Island, June 27, 1907, *Rosendahl*, no. 1971. WYOMING: small willows, Middle Ten Sleep Creek, Big Horn Co., August 1, 1901, *Goodding*, no. 465; Little Goose Cañon, Sheridan Co., July 1, 1901, *A. Nelson*, no 2383. IDAHO: Grand Saline (Salt River?), *Burke*. CALIFORNIA: Yosemite region, 1893, *J. B. Lembert* (*S. Lemberti* Greene); Soda Springs, Tuolumne Co., July, 1894, *Lembert* (distributed by Congdon as C 171).

S. INDECORUS Greene, Fl. Francisc. 470 (1897). *S. discoideus* Hook. ex. Torr. & Gr. Fl. N. A. ii. 442 (1843) as to plant described; Britton in Britton & Brown, Ill. Fl. iii. 479, fig. 4042; not *S. aureus* δ *discoideus* Hook. Fl. Bor.-Am. i. 333 (1834). *S. idahoensis* Rydb. Bull. Torr. Bot. Cl. xxvii. 183, t. 6, fig. 5 (1900); Greenman, Monogr. Senecio, I. Teil, 24 (1901), in Engler, Bot. Jahrb. xxxii. 20 (1902), Ann. Mo. Bot. Gard. iii. 96 (1916). *S. Burkei* Greenman, Ott. Nat. xxv. 114 (1911), Ann. Mo. Bot. Gard. ii. 626, t. 20, fig. i. (1915), ibid, iii. 136 (1916).—Slender, 2–9 dm. high: leaves membranaceous; the basal slender-petioled, oblong, elliptic or ovate, cuneate to subcordate at base, sharply or often incisely toothed or sometimes pinnatifid; the middle and upper usually sessile, 4–11 below the inflorescence, oblong, lanceolate or oblanceolate, incisely and variously cut into sharp teeth or lobes; the uppermost leaves greatly reduced or obsolete; heads 6–40, slenderly cylindric-urceolate (when fresh), discoid or radiate: involucres usually green or merely with purple tips: the acute bracts 0.5–1 mm. broad: filiform tube of corolla 3.6–6 mm. long; lobes yellow: achenes drab or gray-brown, slender, strongly costate, 2–3 mm. long: mature involucre strictly reflexed: denuded receptacle convex, conspicuously alveolate; the walls of the pits very

thin and jagged or almost fimbriate.—Rich thickets, swales and calcareous rock, Gaspé Co., Quebec to the Lake Superior Region; British Columbia to Idaho and northern California. The following are in the Gray Herbarium. QUEBEC: sandy alluvium of Rivière Ste. Anne des Monts, Gaspé Co., August 3–17, 1905, *Collins & Fernald;* clearings and bushy swales along Rivière Ste. Anne des Monts, July 22, 1923, *Fernald, Griscom, Mackenzie & Smith,* no. 26,095; wet calcareous headland by the River St. Lawrence, Grosses Roches, Matane Co., July 17, 1922, *Fernald & Pease,* no. 25,340; openings in Arbor Vitae swamps, Carleton, Bonaventure Co., July 24 and 27, 1904, *Collins, Fernald & Pease;* edge of Arbor Vitae swamp, July 18–21, 1905, *Williams, Collins & Fernald;* dry spruce woods at base of limestone-conglomerate cliffs, Bic, Rimouski Co., July 16, 1904, *Collins & Fernald;* meadows and swamps in slaty region south and east of Bic, July 17, 1907, *Fernald & Collins,* no. 1202 (some heads radiate); dry limestone-conglomerate ledges, south of Bic, July 28, 1907, *Fernald & Collins,* no. 1203; pastures, Rivière du Loup, Temiscouata Co., July, 1913, *Victorin,* no. 40; Roberval, Lake St. John, July 15, 1892, *G. G. Kennedy;* sur les calcaires paléozoiques de l'Ouiatchouan inférieur, Val-Jalbert, Lake St. John, July 22, 1921, *Victorin,* no. 15,436; Spirit Lake (Abitibi), Pontiac Co., July 9, 1918, *Victorin,* no. 8517. MICHIGAN: Champion, July, 1889, *E. J. Hill;* Keweenaw Peninsula, 1863, *Robbins:* Keweenaw Co., July, 1890, *Farwell,* no. 776. BRITISH COLUMBIA: Kicking Horse Valley, alt. 4000 ft., July 15, 1906, *S. Brown,* no. 487a; river-margins, Silver City, August 7, 1885, *J. Macoun;* Griffin Lake, July 6, 1889, *J. Macoun;* Carbonate, altitude 2700 ft., July 7, 1904, *Heacock,* no. 185; Wapta Lake, August 4, 1904, *J. Macoun,* nos. 65,015, 65,020; Skagit Valley, altitude 2500–3000 ft., various dates in July and August, 1905, *J. M. Macoun,* nos. 69,358–65,360; Chilliwack Valley, altitude 3000–4500 ft., various dates, 1901, *J. M. Macoun,* nos. 26,682–26,685; Sophie Mt., altitude 5500 ft., July 17 and 20, 1902, *J. M. Macoun,* nos. 64,990, 64,991; Creston, Kootenay, June 22, 1914, *J. K. Henry,* no. 4; gravel-bed of mountain-stream, Armstrong, July 4,—, *E. Wilson,* no. 247. IDAHO: meadows at Granite Station, Kootenai Co., July 30, 1922, *Sandberg, MacDougal & Heller,* no. 803 (type-number of *S. idahoensis* Rydb.); Forks of St. Mary's River, altitude 1100 m., July 3, 1895, *Leiberg,* no. 1158; Grand Saline (? Salt River, tributary to the Snake), August 16, ——, *J. Burke* (type of *S. Burkei*). WASHINGTON: Big Meadows, Stevens or Spokane Co., August 6, 1902, *Kreager,* no. 428; damp forest, Newman Lake, July 9, 1916, *Suksdorf,* no. 8797; Mt. Constitution, Orcas I., San Juan Islands, August, 1892, *Henderson,* no. 2312, June 25–August 1, 1917, *Zeller,* no. 1252. CALIFORNIA: wet meadows, Pine Creek, Lassen Co., July 9, 1894, *Baker & Nutting* (photograph of TYPE of *S. indecorus*).

Most of the eastern specimens have been distributed as *S. discoideus;* the western as *S. pauciflorus, S. Burkei* and *S. idahoensis.*

Explanation of Plate 144.

Fig. 1[1], *Senecio resedifolius* × 1, from Mt. Pembroke, Matane Co., Quebec, *Fernald & Smith*, no. 26,103; 1[2], from Mt. Fortin, Matane Co., Quebec, *Fernald & Smiih*, no. 26, 101; 1[3] and 1[4], from Table Mt., Port à Port Bay, Newfoundland (*S. Fernaldii*), *Fernald & St. John*, no. 10,873; 1a, young plant × 1 from Mt. Fortin, Quebec, *Fernald, Griscom & Mackenzie*, no. 26, 099; 1b, denuded receptacle × 4. Fig. 2, *S. pauciflorus* × 1; 2b, denuded receptacle × 4; 2c, mature involucre × 1; 2d, achene × 4. Fig. 3, upper half of small plant of *S. indecorus* × 1; 3b, denuded receptacle × 4; 3c, mature involucres × 1; 3d, achene × 4.

V. NEW OR RECENTLY RESTUDIED PLANTS OF EASTERN AMERICA.

Carex Hostiana DC., var. **laurentiana** (Fernald & Wiegand) Fernald & Wiegand, n. comb. *C. fulvescens* Mackenzie, Bull. Torr. Bot. Cl. xxxvii. 239 (1910). *C. Hornschuchiana*, var. *laurentiana* Fernald & Wiegand, Rhodora, xiii. 130 (1911).

C. Hostiana DC. Cat. Pl. Hort. Bot. Monsp. 88 (1813) was well described and the plate of *C. fulva* Host, not Goodenough, was cited. Although Kükenthal retains for the species the name *C. Hornschuchiana* Hoppe (1824) he definitely cites the perfectly described *C. Hostiana* (as *C. Hosteana*) as a synonym.

We have again studied the plant of Newfoundland and Anticosti and can find no characters not shown by the European *C. Hostiana*, merely a tendency to slightly larger size of the parts; and several European specimens so closely approach var. *laurentiana* that it might be urged with good reason that the variety is scarcely worthy of separation.

Salix Bebbiana Sargent, var. **luxurians** (Fernald), n. comb. *S. rostrata*, var. *luxurians* Fernald, Rhodora, ix. 223 (1907). *S. Bebbiana*, forma *luxurians* (Fernald) Schneider, Journ. Arn. Arb. iii. 75 (1921).

Schneider shows[1] that *Salix rostrata* Thuill. (1797) is not a perfect synonym of *S. repens* L. but that it is identified with two generally recognized varieties of that species and by those who would treat either of these variations as species the name *S. rostrata* Thuill. would have to be used. Under these circumstances the name *S. rostrata* Richardson (1823) for the characteristic American species must give way to *S. Bebbiana* Sargent (1896). Schneider considers var. *luxurians* as "nothing but a forma luxurians," which "should be looked for in other localities of the type." In the vast accumulation of American

[1] Schneider, Journ. Arn. Arb. ii. 68 (1920).

A. E. Brackett del

FIG. 1, SENECIO RESEDIFOLIUS. FIG. 2, S. PAUCIFLORUS. FIG. 3, S. INDECORUS.

Salix which Schneider studied, however, he saw var. *luxurians* only from the "banks of the St. Lawrence from Rimouski Co. to Gaspé Co.," Quebec. There it is the characteristic extreme of *S. Bebbiana* and on account of its very long capsules (9–12 mm.) and long pedicels (5–8.5 mm.), its plane rather than rugose leaves and its great stature it might almost be considered a species. In *S. Bebbiana* (typical) and *S. Bebbiana*, var. *perrostrata* (Rydb.) Schneider, the mature capsules are usually 5–8 mm. long though in very exceptional specimens they reach 1 cm. and the mature pedicels range from 2–6 mm. in length.

S. Bebbiana var. **capreifolia** (Fernald), n. comb. *S. rostrata*, var. *capreifolia* Fernald, Rhodora, xvi. 177 (1914).

Salix **hebecarpa** (Fernald), n. comb. *S. fuscescens*, var. *hebecarpa* Fernald, Rhodora ix. 224 (1907).

When *S. hebecarpa* was originally published it was taken for an extreme of the Alaskan *S. fuscescens* Anderss. with pubescent capsules and the shrub growing with it but having the capsules glabrous (though the pedicels pubescent) was identified with *S. fuscescens*. Collections made on Mt. Albert in July, 1923 by Messrs. Griscom, Mackenzie, Smith and myself at the type station for *S. fuscescens*, var. *hebecarpa* show that the pubescence of the fruit is by no means constant but in all other characters the Mt. Albert material forms a consistent series; and a second sheet of true Alaskan *S. fuscescens* which has recently come to hand shows that it and the Mt. Albert shrub have quite different leaf-venation, and that the Alaskan shrub has darker scales and smaller capsules. *S. hebecarpa* stands between *S. fuscescens* and *S. pedicellaris* Pursh. From the latter it is separated by its more obovate leaves, the more pubescent and darker scales of the ament, the much shorter, thicker and pubescent pedicels (about equaling to twice as long as the scales), the long nectary and the definite style. The following specimens, all from alpine bogs on Mt. Albert, Gaspé County, Quebec, are representative. The form with glabrous or glabrescent capsule is marked "gl."

August 8–15, 1905, *Fernald & Collins* (gl); July 21, 1906, *Fernald & Collins*, no. 206 (gl), no. 207 (type in Gray Herb.); July 24, 1923, *Fernald, Griscom, Mackenzie & Smith*, no. 25,686 (gl).

Oplopanax horridum (Sm.) Miquel. The Devil's Club is known in our eastern manuals as *Fatsia horrida* (Sm.) B. & H. or as *Echinopanax horridum* (Sm.) Decaisne & Planchon. It seems to be a mono-

typic genus (though the Japanese plant is sometimes separated) clearly distinguished from *Fatsia*, and by the International Rules of Botanical Nomenclature its name should be *Oplopanax horridum* (Sm.) Miquel. *Echinopanax* Decaisne & Planchon, Rev. Hort. Sér. 4, iii. 105 (1854) was started as a genus merely by the statement, "Un autre type très remarquable (*Echinopanax* Nob.) est fourni par le *Panax horridum*." Absolutely no differential character was given by which any one else could tell on what points *Echinopanax* rested as a genus; that highly important detail being left for others to struggle with, they, if successful, giving the credit for the solution to the authors who had not taken sufficient pains themselves to point out the differential characters. The International Rules wisely exclude these names, the authors of which, to use the slang of the day, "pass the buck," stating (Art. 38) that "The mere indication of species as belonging to a new genus or of genera as belonging to a higher group, does not allow us to accept the genus or group in question as characterized and effectively published." The American Rules, however, accept such irresponsible publication and by that code *Echinopanax* is a properly published genus. So far as a prolonged search has revealed, the first satisfactorily published generic name for the Devil's Club is *Oplopanax* Miquel, Ann. Mus. Bot. Lugd.-Batav. i. 16 (1863), which was based upon Torrey & Gray's *Panax* § *Oplopanax*, a section set off by them with a real characterization.

Nelson & Macbride, Bot. Gaz. lxi. 45 (1916), have revived the name *Ricinophyllum* and have made the combination *R. horridum* (Sm.) Nelson & Macbr.; but a moment's examination of the original publication would have shown that *Ricinophyllum* was merely indicated in synonymy as an herbarium-name found on an old sheet of *Panax horridum* Sm. The name *Ricinophyllum*, therefore, has no nomenclatorial status.

HACKELIA DEFLEXA (Willd.) Opiz, var. **americana** (Gray) Fernald & Johnston, n. comb. *Echinospermum deflexum*, var. *americanum* Gray, Proc. Am. Acad. xvii. 224 (1882). *Lappula deflexa*, var. *americana* (Gray) Greene, Pittonia, ii. 183 (1891). *L. americana* Rydb. Bull. Torr. Bot. Cl. xxiv. 294 (1897).

When the genus *Hackelia* was recently taken up[1] the American plant was merged with the European since the character relied upon by Gray in separating it, namely, the presence of a few prickles on

[1] Johnston, Contrib. Gray Herb. n. s. No. lxviii. 43–48 (1923).

the back of the fruit, was found to be very inconstant. Recent examination of the American material, however, shows that it differs from the European in having the leaves elliptic-lanceolate or narrowly ovate and acuminate, the leaves of the European type being spatulate-oblanceolate. In the latter plant the back of the fruit is deltoid-ovate; in the American plant more definitely deltoid. Typical *L. deflexa* extends eastward into China while var. *americana* is present in Amur (*Maximowicz*).

AGOSERIS **gaspensis**, spec. nov., perennis; foliis lineari-lanceolatis flaccidis integris vel remote pinnato-incisis glabris basi ciliatis; scapo deinde folia superante apice villoso; involucri bracteis lanceolatis attenuatis 1.5–2 cm. longis, exterioribus viridibus apice recurvatis basi valde villoso-ciliatis, ciliis 1–2 mm. longis, bracteis interioribus scariosis valde purpureo-maculatis; floribus aeneis; pappo albo deinde 1.2–1.5 cm. longo, setis minute serrulatis: achenio lineari-fusiformi 7–9 mm. longo glabro, rostro 5–7 mm. longo firmo vix filiformi glabro. —Tabletop Mountains, Gaspé County, QUEBEC: dry stony subalpine meadows, at 1100–1200 m. altitude, east of Lac Perrée, August 14, 1923, *M. L. Fernald, C. W. Dodge, & L. B. Smith*, no. 26,119; alpine and subalpine meadows and brooksides, northern and northeastern slopes (alt. 950–1300 m.) of Mt. McNab, August 7, 1923, *Fernald, Dodge & Smith*, no. 26,120 (TYPE in Gray Herb.); subalpine meadows on southern slope (alt. about 1200 m.) of Mt. Au Clair, August 10, 1923, *Fernald & Smith*, no. 26,121.

Strongly simulating *Agoseris gracilens* (Gray) Kuntze of the region from southern Alberta and British Columbia to Wyoming, Utah, Nevada and northern California. That species, however, as shown by Gray's original material of *Troximon gracilens*, has the body of the achene only 5–7.5 mm. long and hispid at summit (in *A. gaspensis* 7–9 mm. long and glabrous); the delicate filiform beak 6–8 mm. long (the stouter and firm beak of *A. gaspensis* 5–7 mm. long); and the mature pappus only 8–10 mm. long (in *A. gaspensis* 1.2–1.5 cm. long). Furthermore, in *A. gracilens* the disk at the tip of the beak is about 0.5 mm. in diameter, in *A. gaspensis* nearly twice as broad.

A. gaspensis is of peculiar interest because it is the first member of this predominantly cordilleran genus to be found in the Shickshock Mountains, a region in which the cordilleran relationship is very pronounced and already well known through such plants as *Polystichum mohrioides*, var. *scopulinum* (D. C. Eaton) Fernald (discussed on p. 89), *Salix brachycarpa* Nutt., *Dryas Drummondii* Richardson, *Lonicera involucrata* (Richardson) Banks, and hundreds of others.

The genus which was long called in America and which is maintained by Dalla-Torre & Harms as *Troximon* Nutt. should be known as *Agoseris* Raf. The question was cleared by Greene in 1891,[1] but more recently Hall,[2] who has been followed by other western botanists has urged the retention of *Troximon* in the following words.

"The reinstatement of the genus Agoseris Raf. (1817) has been proposed for those species of Troximon in which the achenes are beaked. But the two groups are best received into one genus, being connected by the thick-beaked *T. glaucum*. Troximon was first used as a generic name by Gaertner (1791) but since his genus is not sustained, we may properly write Troximon Nutt. (1813) as the name of the present group."

In Hall's argument several fundamental facts seem to have been overlooked. In 1791 Gaertner[3] published *Troximon* as a genus based upon three Linnean species of *Tragopogon*, *Trag. Dandelion*, *T. virginicum* and *T. lanatum*. The three species were, according to *Index Kewensis*, formally named *Troximon Dandelion*, *T. virginicum* and *T. lanatum* by F. W. Schmidt in 1795 and they were certainly described under these binomials by Persoon in 1807. The first two are species of *Krigia* Schreber (1791), belonging to the subgenus *Cynthia* (D. Don) Gray, which is often maintained as a distinct genus *Cynthia* D. Don (1829).[4] The third species, *Trox. lanatum*, is generally referred to *Scorzonera* L. (1753). By whichever principle we reason, whether we typify *Troximon* Gaertn. by its first species, by the greater number of species or by the exclusion from it of the species (*T. lanatum*) which belongs to the earlier-published *Scorzonera*, we arrive at the same conclusion, that

TROXIMON Gaertn. (1791) = CYNTHIA D. Don (1829) and should be used by those who maintain *Cynthia* as generically distinct from *Krigia* Schreb. (1791). Whether *Krigia* (1791) has priority over *Troximon* (1791) I have as yet been unable to determine.

Hall, apparently considering Troximon Gaertner as a "genus . . . not sustained" would retain "Troximon Nutt. (1813)." But what was *Troximon* Nutt. (1813)? The reference ordinarily given is to Nutt. in Fraser's Cat. nos. 83 and 84. Fraser's *Catalogue*

[1] Greene, Pittonia, ii. 176 (1891).
[2] Hall, Univ. Cal. Pub. Bot. iii. No. 1: 276 (1907).
[3] Gaertn. Fruct. ii. 360 (1791).
[4] D. Don, Edinb. New Phil. Journ. vi. 309 (1829).

was merely a list of names and the complete treatment under nos. 83 and 84 was as follows:

"83* Troximon ciliatum. ‡ M.

84* ————————glaucum. ‡ M."

This certainly does not constitute satisfactory publication of a genus. The next reference commonly given is to Pursh, Fl. Am. Sept. ii. 505 (1814). But Pursh gave absolutely no generic diagnosis and ascribed the genus without question to Gaertner and to Persoon. That Pursh had no thought of setting up a new genus is perfectly evident from the fact that he has two species, *T. glaucum* which is an Agoseris, and *T. virginicum* which was one of the original species of *Troximon* Gaertn. Nor did Nuttall in his Genera, ii. 127 (1818) indicate any intent to set off a new genus *Troximon* as distinct from Gaertner's genus; for he ascribed *Troximon* directly to Gaertner and he so far accepted Gaertner's definition as to include the oriental *T. lanatum* which belongs to the genus *Scorzonera*.

In 1817 Rafinesque properly published *Agoseris*[1] and again, in 1819,[2] he gave a good characterization of the genus. There is no question, then, that AGOSERIS Raf. (1817) is the correct name for the genus which still passes erroneously as *Troximon* "Nutt.," and that TROXIMON Gaertn. (1791) is the correct name for *Cynthia* D. Don (1829).

[1] Raf. Fl. Ludov. 58 (1817).
[2] Raf. Journ. de Phys. lxxxix. 100 (1819).

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

NEW SERIES.—LXXIII.

ISSUED SEP 24 1924

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I. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—IV.

By B. L. Robinson.

Since publishing about a year ago the preceding installment of similar records, the writer has had opportunity to examine several extensive series of specimens throwing further light upon the classification of the *Eupatorium* tribe. The chief sources of this material have been as follows: 1) A third loan of more than a hundred specimens from the Museum of Natural History in Paris, including a few additional plants of the very interesting Brazilian collection of Auguste de Saint-Hilaire and an admirable suite of Triana plants from Colombia, the latter being unusual from the fact that they bear the original detailed geographic and ecological data of collection. 2) The later gatherings of Dr. H. A. Gleason and Mr. J. S. De La Cruz in British Guiana. 3) The *Compositae-Eupatoricae* secured on the second expedition of the Field Museum of Natural History for the botanical exploration of Peru. These plants collected by Mr. J. Francis Macbride had the same high excellence as those of the preceding expedition and included many novelties of unusual interest. 4) The *Compositae-Eupatorieae* of Prof. Hitchcock's expedition to Ecuador, admirably supplementing the earlier collecting of Dr. J. N. Rose and including material from some regions, such as the valley of the Pastaza River to the east of Mt. Chimborazo, scarcely if at all explored previously and yielding noteworthy novelties. 5) Miscellaneous *Eupatoricae* referred to the writer by the United States National Herbarium from Panama, Costa Rica (collections of Dr. W. R. Maxon and assistants), and Honduras (collection of Mr. M. A. Carleton); by the New York Botanical Garden from the West Indies; by the Missouri Botanical Garden from Panama and Central America (collections of Dr. J. M. and Mr. M. T. Greenman). 6) Previously unstudied portions of large loans from the Royal Gardens of Kew and from the University of Geneva. 7) A considerable series of excellent photographs obtained by purchase from the Botanical Museum at Berlin and showing the precise identity of many species hitherto imperfectly known in America.

Such new data as have been obtained from these sources relative to the further classification of the *Eupatoricae* may be put on record as follows:

Ophryosporus (§ **Ophryochaeta**) **apricus**, spec. nov., suffrutescens inclinatus gracilis supra patenter ramosus; caulibus teretibus ca. 3

mm. crassis dense pubescentibus pallide brunneis; internodiis 6–12 cm. longis; ramis curvatis; foliis oppositis ovatis vel ovato-oblongis acuminatis basi rotundatis vel subacutatis basin versus integris aliter serratis (dentibus usque ad 1 mm. altis et 4 mm. basi latis) supra parce puberulis subtus paullo pallidioribus breviter praecipue in nervis brunneo-pubescentibus supra basin pinnatim 5–7-nervatis inter nervos delicate reticulatis 3.5–4.5 cm. longis 1.8–2.8 cm. latis membranaceis; petiolo ca. 8 mm. longo dense brunneo-pubescenti; paniculis terminalibus et lateralibus patenter ramosis et laxiusculis foliaceo-bracteatis 1–1.5 dm. longis 6–12 cm. diametro saepe ad apicem caulis in inflorescentiam magnam laxam compositam conjunctis; capitulis ca. 7-floris breviter pedicillatis ca. 4.5 mm. altis et 3.5 mm. diametro; involucri squamis ca. 7 longitudine subaequalibus oblongis apice rotundatis ciliolatis dorso glabris vel subglabris ca. 3 mm. longis et 1 mm. latis, intimis 1–2 angustioribus oblanceolatis; corollis albis ca. 3 mm. longis; tubo proprio 1.5 mm. longo glandulari-puberulo; faucibus paullo ampliatis ca. 1 mm. longis; dentibus limbi 5 deltoideis patentibus 0.5 mm. longis; achaeniis immaturis glabris ca. 1.3 mm. longis; pappi setis ca. 25 vix scabratis corolla paullo brevioribus. —PERU: sprawling in sunny montaña, about 1830 m. alt., July 17–26, 1923, *J. F. Macbride*, no. 5204 (TYPE, Field Mus.; ISOTYPE, Gr.). This species most nearly approaches the Ecuadorian *O. Sodiroi* Hieron. but has much more sharply and deeply toothed leaves, narrower and oblong rather than obovate involucral scales, and much smaller stigmas.

O. (§ **Ophryochaeta**) **Macbridei**, spec. nov., fruticosus gracilis ca. 1.5 m. altus oppositirameus; caulibus teretibus juventate crispe puberulis mox glabratis ca. 3 mm. crassis medullosis; medulla alba; internodiis 4–9 cm. longis; foliis oppositis breviter petiolatis oblongis longe acuminatis basi acutis supra mediam partem utroque obscure 3–4-serrato-dentatis (dentibus 0.5 mm. altis et 4 mm. inter se distantibus) vel subintegris plerisque deflexis 5–6 cm. longis 1.5–2 cm. latis utrinque praecipue in costa nervisque paullo hirtellis supra basin 3-nervatis in aetate bullescentibus et subcoriaceis subtus vix pallidioribus; petiolo 3–5 mm. longo; paniculis et axillaribus et terminalibus foliaceo-bracteatis compositis sordide villosulis; capitulis breviter pedicellatis 5–7-floris in corymbis convexis subdensis gestis ca. 5.5 mm. altis; bracteolis lanceolatis vel spatulato-oblanceolatis vel linearibus 1–3 mm. longis; pedicellis 1–1.5 mm. longis; involucri squamis ca. 6 oblongis ciliolatis dorsaliter subglabris ca. 3.5 mm. longis et 1 mm. latis apice rotundatis, extimis 4 basin versus cum nervis 2 calloso-incrassatis munitis; corollis tubulatis ca. 2.5 mm.

longis sine faucibus distinctis; dentibus limbi patentibus ca. 0.7 mm. longis; styli ramis leviter clavatis; achaeniis ca. 1.5 mm. longis glabris; pappi setis ca. 20 corollam subaequantibus albidis vix scabratis. —PERU: slender shrub of sunny thicket-edges, Yanano, alt. about 1830 m., May 13–16, 1923; *J. F. Macbride*, no. 3717 (TYPE, Field Mus.; ISOTYPE, Gr.). Falling into the group with the Bolivian *O. Cumingii* (Sch.-Bip.) Benth. and *O. Kuntzei* Hieron., this species is readily distinguished from both by its much larger and more open inflorescence and its subentire leaves of firmer texture.

Eupatorium (§ **Hebeclinium**) **beneolens,** spec. nov., suffruticosum vel fruticosum 1–3 m. altum regulariter patenterque ramosum; caule tereti 7 mm. vel ultra crassitudine medulloso; medulla alba; indumento pallide brunneo copioso et patenter lanato-velutino vel breviori et subappresso-sericeo; internodiis 5–9 cm. vel ultra longitudine; ramis curvato-adscendentibus; foliis oblongis vel rhombeo-ovatis gradatim acuminatis basi acuta et apice exceptis serratis (dentibus 0.3–2 mm. altis 3–5 mm. basi latis apice callosis) firmiter membranaceis supra viridibus inconspicue villosis subtus pallidioribus subsericeo-pubescentibus pinnativeniis 12–17 cm. longis 5–7.5 cm. latis; costa media densissime sericeo-velutina in facie inferiori exserta, venis lateralibus numerosis utroque ca. 12–19 prorsus curvatis; petiolo 1–3 cm. longo; panicula terminali pyramidali 13–19 cm. alta 17–27 cm. diametro oppositiramea; bracteolis linearibus; capitulis sessilibus ca. 6 mm. altis et 3.5–4.5 mm. diametro ca. 17-floris; involucri subcampanulati squamis ca. 20 ut dicitur roseis sed post exsiccationem brunnescentibus margine pallidis conspicue ciliatis. subuninerviis apice subacutis vel rotundatis 3–4-seriatim imbricatis, extimis ovatis multo brevioribus, intermediis oblongo-linearibus, intimis linearibus plerisque acutis in sicco patenter recurvantibus; disco convexo hispido-villoso; flosculis ut dicitur fragrantibus; corollis albis glabris ca. 4 mm. longis; tubo proprio 2.5 mm. longo; faucibus cylindratis 1.5 mm. longis vix ampliatis; dentibus limbi deltoideis patentibus 0.5 mm. longis; antheris subliberis apice conspicue appendiculatis; achaeniis ca. 1.3 mm. longis glabris stramineis vel tardius nigrescentibus cum costis pallidis; pappi setis ca. 30 albis corollam subaequantibus.—PERU: a liana-like shrub with whitish flowers, Muña, trail to Tambo de Vaca, June 27, 1923, alt. about 2440 m., *J. F. Macbride*, no. 4912 (TYPE, Field Mus.; ISOTYPE, Gr.); a straggling shrub 3 m. high with fragrant greenish-white flowers, at same place and altitude, June 5–7, 1923, *J. F. Macbride*, no. 4270 (Field Mus., Gr.).

This species from its hairy receptacle is clearly of § *Hebeclinium* and differs much both in habit and technical features from *E. ne-*

morosum Klatt and *E. macrophyllum* L., the only other species of this section thus far known from Peru.

In *E. benedens* two marked pubescence-forms are to be noted in the admirable series of specimens secured by Mr. Macbride, namely:

Forma **typicum**, caule densissime patenterque velutino-tomentoso sublanato.—Distrib. and exsicc. as above.

Forma **ctenotum**, forma nova, caule subsericeo-pubescenti, indumento denso quam apud formam typicam breviori et quasi pectinato subappresso.—PERU: sunny brush-lands, a half shrub 1–3 m. high, uniformly branching; inflorescences terminal; involucral scales pink; fls. white, very fragrant, Muña, trail to Tambo de Vaca, about 2440 m. alt., June 27, 1923, *J. F. Macbride*, no. 4917 (TYPE, Field Mus.; ISOTYPE, Gr.); also slender-stemmed open-branched shrub about 3 m. high at edge of a bamboo thicket, alt. about 1982 m., Huacachi, near Muña, 20 May to 1 June, 1923, *J. F. Macbride*, no. 4085 (Field Mus., Gr.).

E. (§ **Conoclinium**) **bullatissimum**, spec., nov., herbaceum perenne fortasse frutescens (basi ignota); caule tereti flexuoso incurvo-puberulo 5 mm. diametro albo-medulloso; foliis oppositis petiolatis ovatis acuminatis basi rotundatis plus minusve crenatis valde supra basin pinnatim 5-nervatis grosse reticulato-venosis utrinque in nervis et venis principibus puberulis supra atroviridibus valde rugosis subtus laete viridibus cum venis valde exsertis reticulatis (areolis plerisque 1–3 mm. diametro) textura membraceis 8–13 cm. longis 4.7–6 cm. latis; petiolo puberulo tereti ca. 12 mm. longo; appendicibus stipuliformibus nullis; panicula terminali basi foliaceo-bracteata divaricatim oppositiramea ovoidea ca. 2 dm. longa et crassa fulvido-tomentella; capitulis ca. 22-floris sessilibus ad apices ramorum subglomeratis ca. 5 mm. longis; involucri campanulati squamis regulariter gradatis ca. 35 ovatis apice rotundatis dorso viridibus glabris 2–3-striatis margine ciliolatis; receptaculo subhemisphaerico glabro; corollis graciliter tubulatis ca. 3 mm. longis ut videtur atropurpureis saltim post exsiccationem fuscescentibus sine faucibus distinctis; limbi dentibus brevibus plus minusve puberulis; achaeniis nigris crassiusculis ca. 1.3 mm. longis lucidulis in angulis paullo scabratis; pappi setis ca. 30 albis barbellatis corollas subaequantibus.—ECUADOR: Province Tungurahua: edge of woods, Valley of Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,814 (TYPE, Gr.). This species on account of its much elevated indeed nearly hemispherical receptacle falls technically in the § *Conoclinium*, and is of course very different from either of the two Ecuadorian species heretofore known

to belong to this section, namely, *E. lamiifolium* HBK. and *E. Turczaninowii* Robinson both of which have leaves which are densely gray- or white-tomentose beneath, longer petioles and many other differences. *E. bullatissimum* in many respects resembles the still obscure *E. smilacinum* HBK. of Colombia, but that is said to have angulate branches, much smaller leaves hispid beneath and provided with a petiole about a quarter as long as the blade.

E. (§ **Cylindrocephala**) **caldense**, spec. nov., arboreum oppositirameum; ramis primo distincte sexangularibus deinde subteretibus post exsiccationem multicostulatis purpureo-olivaceis villosulis et minute granuliferis; pilis patentibus delicatulis articulatis; internodiis 6 cm. vel ultra longis; foliis oblongis acuminatis integris basi subacutis breviter petiolatis supra basin 3-nervatis supra primo inconspicue pubentibus tardius glabratis et subbullatis subtus vix pallidioribus persistenter pubescentibus crassiuscule membranaceis 5–9 cm. longis 17–32 mm. latis; petiolo 4–7 mm. longo fulvido-tomentello; corymbis terminalibus valde convexis ca. 1 dm. diametro; capitulis ca. 12-floris sessilibus ad apices ramulorum plerumque trinis vel quinis ca. 12 mm. longis 5–6 mm. diametro; involucri cylindrati squamis ca. 21 regulariter ca. 5-seriatim gradatis arcte adpressis apice obtusissimis vel rotundatis conspicuiter ciliatis dorso subherbaceis 3-nervatis, extimis suborbicularibus ca. 2.2 mm. longis et 1.7 mm. latis, intermediis oblongis ca. 7 mm. longis et 2 mm. latis, intimis oblanceolato-linearibus subacutis ca. 9 mm. longis et 0.8 mm. latis; corollis roseo-albis glabris tubulatis ca. 5 mm. longis gradatim sursum ampliatis sine faucibus distinctis; dentibus limbi 0.7–0.9 mm. longis; antheris apice bene appiculatis; achaeniis valde immaturis gracilibus deorsum attenuatis angulis minute scabratis ca. 4 mm. longis; pappi setis ca. 30 albidis 4–5 mm. longis.—COLOMBIA: tree on bushy flat, alt. 1400–1600 m., on Rio Quindio above Armenia, Dept. Caldas, in the Cordillera Central, July 25, 1922, *Pennell, Killip & Hazen*, no. 8736 (TYPE, Gr.). This species approaches in many of its characters *E. punctulatum* DC., which, however, has a flatter-topped more fastigiately branched inflorescence, somewhat fewer-flowered heads, and distinctly toothed cauline leaves, longer petioles, and nearly smooth stem. While these differences are not individually strong they are in combination sufficient to make it very unlikely that the present plant of the Central Cordillera can represent the species of Eastern Brazil.

E. (§ **Eximbricata**) **Carletonii**, spec. nov., herbaceum verisimiliter perenne (basi ignota) decumbens 1.5–2 dm. altum obscure adpresseque puberulum aspectu glabrum adscendenter ramosum; caulibus subhexagonis purpureis vix 2 mm. crassis; foliis oppositis petiolatis pal-

matim 3-fidis 3.5–6 cm. longis (petiolo anguste alato 1–2 cm. longo incluso); lobis bifidis vel trifidis vel pinnatim dissectis; rhachibus et segmentis linearibus 1–1.5 mm. latis; lobis ultimis apice obtusis; inflorescentiis terminalibus fastigiatim ramosis irregulariter cymosis planiusculis 3–6 cm. diametro; pedicellis 2–7 mm. longis capillaribus; capitulis ca. 4–5 mm. altis et 4 mm. diametro ca. 20-floris; involucri campanulati squamis anguste lanceolatis acutis viridibus subaequalibus laxe imbricatis plerisque 2-costulatis ca. 3 mm. longis et 0.5 mm. latis minute puberis, extimis 2–4 multo minoribus; corollis laete roseis ca. 2.5 mm. longis glabris; tubo proprio ca. 0.9 mm. longo; faucibus cylindratis vix ampliatis ca. 1.3 mm. longis; dentibus limbi ca. 0.3 mm. longis; achaeniis nigrescentibus 1.2 mm. longis deorsum decrescentibus subglabris; pappi setis 13–15 delicatule capillaribus albis 1.5–2 mm. longis.—HONDURAS: on rocks, Cuyamel, March 30, 1923, *M. A. Carleton*, no. 466 (TYPE, Gr.). This highly interesting species was among plants recently sent from the United States National Herbarium for examination at the Gray Herbarium. It is well marked by its deeply cleft linear-lobed leaves which give it a habit very unlike that of any other Central American species of the genus.

E. (§ **Subimbricata-Cylindrocephala**) **Taunayanum** Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 384 (1909), where listed as a probable novelty but without diagnosis. So far as known to the writer this species has never been described. Its characters, drawn from an isotype (Glaziou's no. 11,002 of the Royal Herbarium at Kew) and manifestly identical material in the Gray Herbarium, are as follows: fruticosum subglabrum; caulibus teretibus post exsiccationem longitudinaliter rugosis 3–6 mm. vel ultra diametro firmiter lignosis per abortionem axis principis saepe quasi dichotomis; ramis curvato-adscendentibus brunneis vel purpureis foliosis vel in parte proximali ob delapsu foliorum nudatis cicatrosis; foliis oppositis breviter sed distincte petiolatis lanceolatis acuminatis basi acuta excepta argute serratis 5–8 cm. longis 12–25 mm. latis supra basin pinnatim 5(–7)-nervatis supra glaberrimis impresse reticulatis subtus pallidioribus in axillis nervorum arachnoideo-lanatis aliter glabris; petiolo 5–8 mm. longo purpureo; internodiis 6–13 mm longis; corymbis densis valde convexis 6–8 cm. diametro; capitulis numerosissimis sessilibus vel subsessilibus saepe binis vel ternis maturitate ca. 1 cm. longis (stylis exceptis) 4–5-floris; involucri cylindrati ca. 7 mm. longi squamis ca. 12 brunnescenti-stramineis 3–4-seriatim laxe imbricatis caducis dorso glabris 2–3-nervatis obtusis vel apice rotundatis ciliolatis, extimis ovatis ca. 2 mm. longis et 0.8 mm. latis, intermediis oblongis ca. 4–5

mm. longis et 1.3 mm. latis, intimis lineari-oblongis ca. 6 mm. longis et 1.2 mm. latis; corollis roseis vel albis graciliter tubulosis ca. 5 mm. longis glabris; achaeniis nigris gracilibus ca. 3 mm. longis deorsum decrescentibus; pappi setis ca. 32 flavescenti-albis barbellatis basin versus paullulo incrassatis.—BRAZIL: in forest of Tijuca near Corcatimba, Rio de Janeiro, *Glaziou*, no. 11,002 (ISOTYPE K., Copenhagen, fragm. Gr.); summit of Tijuca, *E. W. D. & M. M. Holway*, no. 1426 (Gr.); Brazil without locality, *Glaziou*, no. 536 (Gr., from herb. of Klatt).

This species somewhat recalls the following, from all of which it can be readily distinguished: *E. roseum* Gardner which has shorter much blunter and clearly pinnate-veined not pinnately nerved leaves. *E. itatiayense* Hieron. which has much longer internodes, strongly angled stems, greenish-stramineous involucre and 3(not 5–7)-nerved leaves. *Symphyopappus polystachyus* (DC.) Baker which has at least part of its heads much more clearly pedicelled, its involucral scales broader and more stramineous, its achenes shorter and thicker, and its leaves of firmer texture.

E. (§ **Subimbricata**) **desmophyllum**, spec. nov., fruticulosum ca. 3 dm. altum griseo-puberulum vel -tomentellum habitu lavandulaceum erectum a basi decumbenti adscendenter oppositirameum; caule tereti fusco-griseo ad 3 mm. diametro; internodiis 5–12 mm. longis; ramis gracilibus a basi et praecipue in media parte foliosis superne subnudis; foliis oppositis dense fasciculatis linearibus integerrimis sessilibus subacutis margine valde revolutis uninerviis utrinque canescenti-tomentellis 7–15 mm. longis 0.8–1.2 mm. latis; corymbis terminalibus plerisque 3–5-capitulatis ca. 3 cm. diametro; capitulis ca. 18-floris ca. 12 mm. altis 6–8 mm. diametro; involucri turbinato-campanulati squamis ca. 24 pluriseriatim imbricatis scariosis brunnescentibus 5–7-striato-costulatis ciliatis apice rotundatis dorso parce griseo-puberulis vel glabriusculis, extimis brevissimis orbiculari-ovatis, intermediis late oblongis, 4 mm. longis 2 mm. latis, intimis oblongo-linearibus; receptaculo plano glabro; corollis ut videtur albis vel albidis tubulatis 6.5 mm. longis glabris gracilibus sine faucibus distinctis, dentibus limbi lanceolato-oblongis ca. 0.6 mm. longis; achaeniis nigrescentibus minute scabratis ca. 3.2 mm. longis basi callosis; pappi setis ca. 30 corollam subaequantibus flavescenti-albis. —PERU: dry banks above the Rio Marañon, Chavanillo, alt. about 2440 m., Aug. 17–26, 1922, *Macbride & Featherstone*, no. 1975 (TYPE, Field Mus.; ISOTYPE, Gr.). A species of marked habit (suggesting a labiate rather than a composite), obviously related to *E. lavandulaefolium* DC. but differing in its larger more numerously flowered heads,

broader multistriate involucral scales of firmer texture and brownish color, smaller leaves, etc.

E. (§ **Conoclinium**) **dichroum**, spec. nov., ut videtur herbaceum et perenne 5 dm. vel ultra altitudine (basi ignota); caule erecto opposito-ramoso paullo flexuoso post exsiccationem costulato pallide brunneo araneoso-subtomentello; ramis gracilibus adscendentibus foliosis; foliis oppositis rhombeo-ovatis utroque acutis basin cuneatam versus integerrimis aliter inciso- vel crenato-dentatis conspicuiter bicoloribus supra viridibus paullo arrachnoideo-puberulis subtus dense griseo-lanulatis membranaceis 2.8–4.2 cm. longis 1.2–2.4 cm. latis multo supra basin subtrinervatis; petiolo gracili griseo-puberulo 8–12 mm. longo; inflorescentiis terminalibus densis primo subglobosis 1–2 cm. diametro maturitate irregulariter subcorymbosis ca. 4 cm. diametro; pedicellis 2–3 mm. longis; capitulis ca. 20-floris 8 mm. altis 4 mm. diametro; disco subconico; involucri squamis ca. 20 subtriseriatis argute acuminatis leviter striato-costulatis dorso pubescentibus, extimis lanceolatis, interioribus anguste oblongo-lanceolatis; corollis gracilibus; tubo proprio 2 mm. longo; faucibus paullo ampliatis ca. 1.2 mm. longis, dentibus limbi angustis recurvatis extus minute hispidulis; achaeniis 2.2 mm. longis 0.6 mm. crassis atrobrunneis glabris basi calcaratis; pappi setis ca. 32 flavescenti-albidis tenuibus acutis barbellatis.—COLOMBIA: Andes of Bogotá at El Boqueron, alt. 2700 m., October 20, 1852, *J. Triana*, no. 1239 (TYPE, Par., phot. and small fragm. Gr.).

This species in pressed specimen singularly recalls in habit and its gray and green coloration *Verbesina encelioides* though its leaves are much smaller. It is somewhat intermediate between *E. ballotaefolium* HBK. and *E. lanulatum* Robinson. From the former it may readily be distinguished by its cuneate-based and more incisely toothed leaves of rhombic-ovate outline. From the latter it differs in having much larger, thinner, more incisely toothed and somewhat triplinerved leaves. In *E. lanulatum* the throat of the corolla was found to exceed the proper tube while in *E. dichroum* the reverse is the case. In this group and probably from the same region is the slightly known *E. parvulum* HBK. which, however, has leaves truncate at base.

E. DIPLODICTYON Robinson, Proc. Am. Acad. liv. 325 (1918). This species was founded upon a specimen collected in Colombia by Lobb and now in the Kew Herbarium. This was unhappily unaccompanied by more precise locality. It is therefore of interest to recognize in Dr. Pennell's recent collection a specimen which can be confidently identified with this species and therefore establishes its geographic position. Dr. Pennell's label bears the following data: climbing herb

on rocky stream-bank in forest, Cordillera Occidental below Cerro Tatama, Rio San Rafael, Department of Caldas, alt. 2500–2800 m., Sept. 7–11, 1922. This new material, agreeing with that of Lobb in all important respects, differs in having leaves papillo-scabrid and dull above rather than subglabrous and shining. It is probable that these differences are merely individual and perhaps due to the stage of development, the plant of Pennell being still in bud, that of Lobb being fully mature. Re-examination of the species suggests that it is rather closely related to though distinct from the Ecuadorian *E. lamiifolium* HBK. and *E. Turczaninowii* Robinson and would better be referred to § *Conoclinium* rather than § *Campuloclinium*.

E. (§ **Subimbricata**) **eximium**, spec. nov., fruticosum carnosum, in inflorescentia obscure strigilloso-puberulum, aliter glaberrimum; caulibus pluribus 1–2 m. longis teretibus molliter lignosis medullosis ad inflorescentiam terminalem foliosis; internodiis 1–2 cm. longis; foliis oppositis petiolatis oblongis acuminatis basi abruptius acutatis paullo undulatis vel integerrimis margine anguste revolutis carnoso-coriaceis ca. 5–6 cm. longis et 2–3 cm. latis utrinque glaberrimis subtus vix pallidioribus; costa magna conspicui, venis lateralibus paucis pinnatis supra obscuris subtus saepius omnino invisibilibus; petiolo crasso 1–1.2 cm. longo; panicula laxe corymbosa valde convexa transverse ellipsoidea ca. 1.5 dm. alta et 2.5 dm. diametro; pedicellis 9–14 mm. longis gracilibus cum bracteolis parvis filiformibus 1–3 munitis; capitulis numerosis sed nunquam congestis ca. 9-floris 8.5 mm. altis 6 mm. diametro; involucri subcylindrati squamis ca. 10 inaequalibus subtriseriatis, exterioribus lanceolatis acutiusculis, interioribus oblongis ciliolatis apice rotundatis ca. 4 mm. longis et 1.3 mm. latis; corollis anguste infundibuliformibus laete lilaceo-roseis glabris 5 mm. longis; tubo proprio 1 mm. longo; faucibus gradatim ampliatis 3 mm. longis; dentibus limbi 5, lanceolato-deltoideis 1 mm. longis; achaeniis (immaturis) glabris 1.5–2.2 mm. longis; pappi setis ca. 40 albis ca. 4.5 mm. longis.—Costa Rica: vicinity of La Palma, on the road to La Hondura, alt. 1500–1700 m., July 17, 18, 1923, *W. R. Maxon & A. D. Harvey*, no. 7941 (type, Gr., U. S.). "Growing in a bushy mass spreading 1–2 m. in all directions from a large stump."

This exceedingly handsome species is most closely related to the Colombian *E. sciaphilum* Robinson, which however differs in having subsessile much more obtuse leaves and somewhat larger heads, flowers, and achenes. *E. eximium* differs from *E. araliaefolium* Less. in having smaller leaves, fewer-flowered heads, much less unequal involucral scales and much shorter proper tube of the corolla.

Other fleshy species with which *E. eximium* might possibly be confused are *E. parasiticum* Klatt, which has fewer-flowered heads, more ovate leaves, and a scarcely imbricated involucre; *E. arthrodes* Robinson and *E. carnosum* Kuntze, both of which have broad and obtuse outer involucral scales as well as many minor differences in foliage, etc.

E. eximium must be an extraordinarily beautiful object when in full bloom and would seem worthy of horticultural attention.

E. GRANDE Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 347 (1876). To the synonymy of this species may be added with fair confidence *E. angulosum* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 390 (1909). Glaziou's species, merely listed as a doubtful novelty and never given a published diagnosis, was founded upon Glaziou's no. 21,578, which, to judge from an isotype in the herbarium of the Royal Gardens at Kew, is merely very young material of *E. grande*, with the inflorescence as yet too immature to show its long pedicels and openly branched nature which at a later stage become characteristic of the species. In all other respects, so far as the stage of development permits comparison, the correspondence is perfect.

E. (§ **Eximbricata**) **hidrodes**, spec. nov., suffruticosum oppositirameum ad 12 dm. altum (Wright) vel fruticosum 2–3 m. altum (Leon); ramis teretibus post exsiccationem leviter striato-costulatis; ramulis gracilibus a pilis tenuibus moniliformibus atropurpureis indutis; foliis oppositis petiolatis ovatis vel ovato-lanceolatis plerisque subintegris apice subcaudato-attenuatis basi acutis supra glabris vel glabriusculis subtus vix pallidioribus praecipue in nervis hirtellis membranaceis vel aetate subchartaceis paullo supra basin pinnatim 3(–5)-nervatis 6–12 cm. longis 2.4–6 cm. latis; petiolo 1.3–2 cm. longo purpureo-villosulo; panicula terminali corymbiformi basi foliaceo-bracteata patenter ramosa purpureo-pubescenti; pedicellis subfiliformibus ad 1 cm. longis bracteolas 1–3 minimas gerentibus; capitulis ca. 20-floris 6 mm. altis; squamis involucri ca. 12 linearibus 1–2-nervatis acutiusculis vel apice vero subobtusis vel etiam rotundatis vix imbricatis dorso puberulis et cum glandulis globularibus lucidulis instructis; corollis primo purpureis deinde viridescentibus; achaeniis 2.7 mm. longis maturitate atrobrunneis cum glandulis globularibus sessilibus ornatis deorsum decrescentibus apice cum basi styli persistenti paullo incrassata nigra (verisimiliter nectarifera) coronatis; pappi setis corollam subaequantibus saepe purpurascentibus.—*E. celtidifolium*, var. *quintuplinerve* Griseb. Cat. Pl. Cub. 146 (1866), not *E. quintuplinerve* Less. *E. nervosum* Griseb. l. c., not Sw. *E. nervosum*, var. *quintuplinerve* (Griseb.) Gomez, Ann. Hist. Nat.

Madrid. xix. 270 (1890).—CUBA: Prov. Oriente: Los Organos, Sept. 20, *Wright*, no. 2805 (TYPE, Gr.); Loma del Gato and vicinity, alt. 900–1000 m., July 11 to Aug. 14, 1921, *Bros. Leon, Clement & Roca*, nos. 10,184 (N. Y., fragm. Gr.) and 10,374 (N. Y., fragm. Gr.); banks of river, Santa Cruz, Aug. 27, *Wright* without number (Gr.); Cuba without precise locality, *Wright*, no. 2804 (Gr.); Sierra Maestra, *Bro. Leon*, no. 11,048 (N. Y., fragm. Gr.).

For many years this Cuban plant has been a puzzle. It is nearly related to several species long known in the more southern West Indian islands, but can be satisfactorily identified with none of them. Grisebach in his Catalogue referred material of it both to the Jamaican *E. nervosum* Sw. and to a newly proposed variety of *E. celtidifolium* Lam. of the Lesser Antilles. The real *E. nervosum* of Jamaica has its leaves rounded or even retuse at the base, more coarsely and sharply dentate, shorter-petioled and somewhat more firmly nerved. *E. celtidifolium* is an arborescent or even arboreous species with much smoother and lighter-colored twigs and with leaves tending to firmer texture, rounded at base and more falcately attenuate at the tip. There is still a third species to which this Cuban material has been at times referred, namely *E. nudiflorum* A. Rich. Fl. Cub. ii. 41 (1853), but this also, though certainly a closely related species, fails to give a satisfactory resting place for the specimens in question since these have cuneate-based leaves while Richard distinctly states regarding his *E. nudiflorum* that its leaves were obtuse or even rounded at base. As to the varietal name *quintuplinerve* employed by Grisebach it seems unwise to use it in the specific category since it has already been published in connection with a very different plant of Brazil.

The specimens here referred to *E. hidrodes*, while agreeing with each other in all essentials, show considerable variation in the size and texture of the leaves and in the size of the heads and the number of florets. In the presence of close resemblance in other respects it is believed that these differences are individual and developed in response to environment and stage of development. A single specimen (P. Wilson's no. 9303 from rocks in the River San Miguel, Prov. Pinar del Rio, at the other end of Cuba and thus separated by a distance of some 400 miles) has coarsely toothed leaves, in this respect showing some approach to the Jamaican *E. nervosum*, but the leaves are cuneate at the base. Without more copious material, this form with toothed leaves—probably a mere leaf-variant of *E. hidrodes*—cannot be satisfactorily placed.

The name *hidrodes* alludes to the perspiration-like drops which are abundant on the involucral scales, corollas, and achenes.

E. (§ **Subimbricata**) **Hitchcockii,** spec. nov., herbaceum perenne exaltatum ca. 3 m. altum; caule tereti 1.3 cm. vel ultra diametro glabro fistuloso; foliis oppositis magnis longe petiolatis ovatis acuminatis grosse dentatis basi acutis vel acuminatis in parte proximali penninerviis utrinque glabris subtus pallidioribus textura subcarneo-membranaceis, caulinis 2–2.5 dm. longis 1–1.5 dm. latis, dentibus usque ad 4 mm. altis et 15 mm. basi latis cuspidatis, nervis lateralibus utroque ca. 4 prorsus curvatis; petiolo 4–6 cm. longo; appendicibus stipuliformibus nullis; corymbis terminalibus planiusculis vel modice convexis saepe alternirameis vel irregulariter di- vel trichotomis obscure incurvo-puberulis ca. 2 dm. diametro nudis; bracteolis minimis; pedicellis 3–12 mm. longis filiformibus; capitulis ca. 1 cm. longis et 6 mm. diametro ca. 20-floris; involucri 3–4-seriatim imbricati campanulato-cylindrati squamis ca. 20 gradatis primo paullo puberulis deinde glabratis, exterioribus lanceolato-ovatis ca. 2.5 mm. longis et 1.5 mm. latis obtusis, intermediis similibus sed 3–4 mm. longis et 2 mm. latis, interioribus oblanceolati-linearibus ca. 7 mm. longis et 1 mm. latis; corollis roseis 6 mm. longis gracilibus sursum paullo ampliatis sed sine faucibus distinctis; dentibus limbi deltoideis ca. 0.3 mm. longis puberulis; achaeniis gracilibus atrobrunneis glaberrimis deorsum paullo decrescentibus 2.8 mm. longis; pappi setis ca. 60 brunneo-fulvis corollas aequantibus.—ECUADOR: Province Tungurahua: Valley of Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,876 (TYPE, Gr.). A notable species not closely related to any hitherto described from Ecuador. Its leaves are as large as those of *E. morifolium* Mill. and the inflorescence recalls that of a *Verbesina.* It is a pleasure to name this well marked new species for its discoverer who, in addition to his special work on the grasses, has, through his copious collecting in difficult tropical regions, contributed much to the knowledge of other groups.

E. (§ **Subimbricata**) **lithophilum**, spec. nov., fruticosum decumbens 3–5 dm. altum aspectu oculo nudo glabrum sed sub lente brevissime puberulum; caule tereti ad 5 mm. diametro firmiter lignescens curvato-decumbenti maturitate a cortice griseo vel pallide brunnescenti tecto; internodiis 4–35 mm. longis, ramis erectis oppositis plerisque ad inflorescentiam simplicibus 2–4 dm. longis teretibus purpurascenti-brunneis superne puberulo-granulatis; internodiis plerisque 1–8 cm. longis; foliis oppositis petiolatis lanceolatis attenuatis basi cuneata integra excepta argute serratis 3–4 cm. longis 1–1.8 cm. latis membranaceis utrinque viridibus supra scabratis subtus paullo pallidioribus obscure in nervis venisque puberulis a basi trinervatis; petiolo gracili

saepius curvato 6–10 mm. longo; capitulis ca. 30-floris ca. 9 mm. altis et 6 mm. diametro in glomerulos paucos 2–3 cm. diametro congestis; pedicellis saepius 1–4 mm. longis; involucri squamis pluriseriatim gradatis lanceolatis vel anguste lanceolato-oblongis purpureobrunneis acutis vix costatis minute resinoso-granulatis et aliquando vernicosis; receptaculo planiusculo glabro; corollis tubulatis roseis vel albis glabris ca. 5.5 mm. longis sine faucibus distinctis; dentibus limbi deltoideis ca. 0.5 mm. longis; antheris apice bene appendiculatis; achaeniis gracilibus praecipue in angulis sursum hispidulis ca. 3 mm. longis apice ab annulo pallido pappifero coronatis; pappi setis ca. 34 flavescenti-albis minute scabratis apice non incrassatis.—PERU: stone fences and rocky cañon-sides, alt. about 2135 m., Aug. 21, 1922, *Macbride & Featherstone*, no. 2235 (TYPE, Field Mus.; ISOTYPE, Gr.). This species, in habit recalling a glomerate-headed *Stevia*, is without close relatives in the Peruvian flora. It bears, however, some slight resemblance to the eastern Brazilian *E. Vauthierianum* DC., but that has much greater stature, much larger leaves, more diffuse inflorescence, more distinctly costulate involucral scales, and puberulent achenes.

E. (§ **Subimbricata**) **mesoreopolum**, spec. nov., fruticosum aliquando scandens; ramis patentibus teretibus post exsiccationem multicostulatis fulvido-tomentellis; foliis oppositis petiolatis ovatis subcrenatis vel integriusculis acuminatis basi abrupte angustatis acutis vel obtusis membranaceis supra brevissime puberulis scabridulis subtus fulvido-tomentellis prominulenter reticulato-venosis 4–11 cm. longis 2–6 cm. latis, venis lateralibus principibus ca. 3-jugis nerviformibus pinnatim a costa 2–11 mm. supra basin divergentibus; petiolo gracili fulvo-tomentello 10–16 mm. longo; paniculis terminalibus multicapitulatis oppositirameis pyramidalibus ca. 10–12 cm. altis 10–18 cm. crassis fulvido-tomentellis; pedicellis filiformibus tomentellis saepe curvatis 4–6 mm. longis; capitulis 18–20-floris ca. 8–9 mm. altis 6 mm. diametro; involucri campanulati 4 mm. alti squamis 22–25 ovatis vel oblongis acutiusculis 3–4-seriatim imbricatis regulariter gradatis dorso 2–3-striato-costulatis tomentellis; receptaculo planiusculo calvo; corollis glabris subtubulatis apicem versus paullo ampliatis ca. 4 mm. longis limbum versus violaceis vel pallide roseis; faucibus vix ullis distinctis; limbi dentibus ovato-deltoideis ca. 0.5 mm. longis; achaeniis stramineis gracilibus glanduloso-atomiferis praecipue ad costas deorsum decrescentibus 2.5–3.5 mm. longis; pappi setis 47–68 inaequalibus laete albis laeviusculis achaenium subaequantibus.—COLOMBIA in the Cordillera Central: shrub in forest at "Pinares" above Salento, Dept. of Caldas, alt. 2600–2900

m., Aug. 2–10, 1922, *Dr. F. W. Pennell*, no. 9209 (TYPE, Gr.), flowers said to be violet; climbing shrub in moist valley at "Calaguala," Coconuco, Dept. of El Cauca, alt. 2500–2800 m., June 14, 18, 1922, *Dr. F. W. Pennell*, no. 7179 (Gr.), flowers said to be pale pink.

This species differs from *E. Stuebelii* Hieron. in its more numerous florets, much looser and more pyramidal inflorescence and thinner less rugose leaves which are pointed at base. From *E. Mayorii* Robinson it differs in its larger and longer-pedicelled fewer-flowered heads, relatively shorter involucre, and longer stramineous gland-sprinkled achenes.

E. (§ **Eximbricata**) **parvulum** Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 390 (1909). This species, named as a doubtful novelty by Glaziou, l. c., but without diagnosis, seems never to have been described. To give the name legal status the following characterization is here put on record, the characters having been drawn from isotypes (Glaziou's no. 15,150 seen in loans from Kew and from the Botanical Museum of Copenhagen). Herbaceum perenne suberectum 2.5–3 dm. altum; caulibus gracilibus teretibus dense foliosis breviter purpurascenti-pubescentibus ad inflorescentiam simplicibus; foliis plerisque alternis oblanceolatis apice rotundatis basi attenuatis leviter crenatis utrinque viridibus pubescentibus punctatis vix petiolatis 1–1.7 cm. longis 4–6 mm. latis; costa media inconspicua; nervis venisque lateralibus obscuris; corymbis alternirameis terminalibus planiusculis ca. 6 cm. diametro; pedicellis filiformibus purpurascenti-pubescentibus 3–8 mm. longis; capitulis ca. 30-floris ca. 7 mm. altis et 7 mm. diametro; involucri turbinati-campanulati squamis ca. 25 sub-biseriatis vix imbricatis lineari-lanceolatis acutis plerisque subaequalibus, exterioribus subherbaceis purpurascenti-pubescentibus obscure 3-nervatis, interioribus substramineis 1-nervatis subglabris; corollis roseis ca. 3.5 mm. longis; tubo proprio brevi ca. 1 mm. longo in fauces subcylindratas ca. 2 mm. longas gradatim paullo ampliato; dentibus limbi ca. 0.5 mm. longis; achaeniis (immaturis) gracilibus pallidis deorsum attenuatis in angulis hispidulis ca. 3 mm. longis; pappi setis ca. 32 sordide flavescenti-albidis ca. 2.5 mm. longis.—BRAZIL: between Ouro Preto and Queluz, Minas Geraës, Feb.–Mar., *Glaziou*, no. 15,150 (ISOTYPE, K., Copenhagen, phot. and small fragm. Gr.). Of characteristic habit and seemingly very distinct from any Brazilian species hitherto characterized.

E. PENINSULARE Brandegee, Erythea, vii. 4 (1899). This species of Lower California is subject to conspicuous variation in its pubescence, as follows:

Var. *a*. obscure pubescens; foliis utrinque viridibus supra glabrius-

culis subtus praecipue in nervis venisque obscure pubescentibus; petiqlo puberulo.—Lower California, San José del Cabo, Sierra de la Laguna, San Francisquito, San Bartolomé, Cañon Hondo, Mesa Verde.

Var. *β*. **epipolimum**, var. nov., griseo-tomentellum; foliis utrinque griseis minute papilloso-puberulis; petiolo dense patenterque griseo-tomentello.—Lower California: Aguaje de Santana, 56 km. north of San Ignacio, alt. 1037 m., Oct. 4, 1905, *E. W. Nelson & E. A. Goldman*, no. 7186 (U. S., fragm. Gr.).

In habit, leaf-form, inflorescence, involucre, etc., agreeing with the smoother typical variety and clearly conspecific with it, but certainly meriting varietal distinction. Material collected at San Juleo Cañon, *Brandegee*, Apr. 20, 1889 (Mo., fragm. Gr.) is intermediate.

E. (§ **Subimbricata**) **procerum**, spec. nov., fruticosum elatum ca. 4.5 m. altum; caulibus teretibus dense crispeque fulvido-tomentellis tardius glabratis post exsiccationem leviter costulatis medullosis 3–8 mm. diametro; internodiis 2–10 cm. longis; foliis oppositis lanceolato- vel ovato-oblongis vel rhombeo-ovatis petiolatis apice acutis vel acuminatis basi subacutis vel obtusis vel etiam rarius rotundatis margine irregulariter grosseque serrato-dentatis vel undulatis vel aliquando etiam integris supra scabris bullatis subtus vix pallidioribus molliter tomentosis textura crassiusculo-membranaceis 8–15 cm. longis 3–6.7 cm. latis penniveniis vel paullo supra basin pinnatim subnervatis; petiolo fulvido-tomentoso 8–13 mm. longo plerunque erecto vel suberecto; corymbis terminalibus et in axillis superioribus orientibus pedunculatis convexis subdensis multicapitulatis 1–3 dm. diametro; pedicellis 4–9 mm. longis tomentellis; capitulis ca. 12-floris 10–12 mm. altis 6–7 mm. diametro; involucri squamis ca. 15 laxe subtriseriatim imbricatis lanceolato-oblongis valde inaequalibus obtusis vel subacutis, extimis ca. 3 mm. longis et 1.2 mm. latis subherbaceis griseo-tomentellis, intimis 6–7 mm. longis ca. 1 mm. latis plerunque 3-costulatis saltim apicem versus puberulo-tomentellis purpurascentibus; corollis rubro-lilaceis glabris 5–6.5 mm. longis glabris; tubo sine faucibus distinctis ca. 5 mm. longo vix sursum ampliato; dentibus limbi patentibus deltoideis 0.7–0.9 mm. longis; achaeniis gracilibus deorsum attenuatis fuscescentibus granulato-scabratis ca. 5 mm. longis; pappi setis ca. 35 flavido-albidis ca. 5.5 mm. longis.—Peru: on steep shrubby slopes, with flowers red-lilac and fragrant, alt. about 2745 m., at Mito, July 8–22, 1922, *Macbride & Featherstone*, no. 1551 (type, Field Mus.; isotype, Gr.); also 3 sheets from herb. of Pavon from Peru but without recorded locality (herb. Univ. Geneva).

This species must be rather closely related to the little known *E. helianthifolium* HBK., which came from Ayavaca toward 1000 km. northward from the Mito material here described. *E. helianthifolium* is known to the writer from a photograph which he made of the type material at Paris some years ago. Microscopic examination of this photograph and close study of the brief and rather unsatisfactory original description seem to leave no doubt as to the probable distinctness of the species here characterized. In *E. helianthifolium* the leaves are much more regularly and definitely serrate, their lateral veins leave the midnerve at a somewhat greater angle and are less curved forward in their course, the upper surface is scabrid, but not at all, or at least by no means to the same extent bullate, the petioles tend to spread widely instead of rising parallel to the stem, and according to the original description the leaves are reticulate-veiny and are beneath punctate with very numerous orange-glands—a feature not observable in the material of *E. procerum*. Finally the inner involucral scales of *E. helianthifolium* are said to be glabriusculous while in *E. procerum* the inner as well as the outer scales are at least toward the tip clearly pubescent. These differences, though individually of no great strength, are numerous and, especially when taken in conjunction with the remoteness of the stations, seem to show the plants pretty certainly distinct.

E. SOLIDAGINOIDES HBK. Nov. Gen. et Spec. iv. 126 (1820). This widely distributed and variable species has long been known from Mexico and Central America, Venezuela, Colombia, Ecuador, and Bolivia, but until now does not appear to have been recorded from Peru. It has, however, been recently collected at the following points in that country; as a slender shrub 1.5 m. high with few erect branches and greenish-yellow flowers, at a hacienda 9 miles above Huertas, Cabello, alt. about 2440 m., June 25, 1922, *Macbride & Featherstone*, no. 1321 (Field Mus., Gr.); as a slender open shrub-liana of dense montaña and with greenish flowers, at La Merced, alt. about 610 m., Aug. 10–24, 1923, *J. F. Macbride*, no. 5258 (Field Mus., Gr.), a form with large subentire leaves; also on a disintegrating granite river-bluff, at the same place, date, and elevation, *Macbride*, no. 5333 (Field Mus., Gr.), a form distinctly lignescent but with a root suggesting that of an annual.

E. (§ **Subimbricata**) **sphagnophilum**, spec. nov., fruticosum erectum; caulibus paucis strictis simplicibus vel adscendenter ramosis teretibus medullosis fusco- vel brunnescenti-tomentellis ca. 9–12 dm. altis ad 8 mm. vel ultra crassitudine; internodiis 2–6 cm. longis; foliis oblongis utroque acutis argute serratis (dentibus 1–1.5 mm. altis 2–3

mm. basi latis) 6–10 cm. longis 2.5–4.7 cm. latis chartaceo-coriaceis penniveniis et utrinque prominulenter reticulato-venosis supra granuliferis subtus paullo pallidioribus crispe fulvido-pubescentibus; venis lateralibus principibus utroque 8–11 prorsus curvatis; petiolo 7–12 mm. longo tomentello; corymbis terminalibus planiusculis vel modice convexis 4–9 cm. diametro densis; pedicellis ca. 2 mm. longis; capitulis 5–6-floris 8–10 mm. longis 5–7 mm. diametro; involucri campanulati squamis ca. 11 valde inaequalibus gradatis obtusis vel apice rotundatis vix costulatis dorso pubescentibus, extimis lanceolatis 2.5 mm. longis 0.7 mm. latis, intermediis oblongis ca. 5 mm. longis et 2 mm. latis, intimis anguste oblanceolato-oblongis ca. 5.5 mm. longis; corollis purpureis albis glabris; tubo sursum gradatim ampliato ca. 4.3 mm. longo sine faucibus distinctis; dentibus limbi ovato-deltoideis ca. 1.2 mm. longis; achaeniis immaturis glabris 2.5 mm. longis; pappi setis ca. 35 inaequalibus sursum barbellatis attenuatis flavidulo-albis plerisque 3.5–4 mm. longis.—PERU: a few-stalked strict bush on sphagnum slopes, alt. about 1830 m., Villacabamba, Hacienda on Rio Chinchao, July 17–26, 1923, *J. F. Macbride*, no. 4968 (TYPE, Field Mus.; ISOTYPE, Gr.). Probably best placed near *E. Macbridei* Robinson, from which, however, it is readily distinguished by its much lower stature, shorter leaves with different indumentum, and purple flowers.

E. THEAEFOLIUM Benth. Pl. Hartw. 199 (1845). The type of this species from the slopes of Mt. Sotaro in the Province of Popayan had leaves 1–1½ inches in length, 4–7 lines wide, oblong in form and, as described by Bentham, acute at both ends. This form may be known as var. **typicum**. From it all material subsequently referred to the species differs in varying degree. The following seems worthy of varietal distinction.

Var. **subellipticum**, var. nov., foliis subellipticis vel elliptico-oblongis apice rotundatis vel obtusis vel rarius subacutis basi plerumque rotundatis 18–25 mm. longis 13–16 mm. latis; aliter formae typicae speciei simillimum.—COLOMBIA: in mountainous districts, Province of Bogotá, alt. 2700 m., Feb. 1854, *Triana*, no. 1221 (TYPE, Par., phot. and small fragm. Gr.); Prov. Pamplona la Baja, alt. 2440 m., *L. Schlim*, no. 1056 (hb. Univ. Geneva). VENEZUELA: Páramo del Tamboi, Merida, *Jahn*, no. 747 (U. S., phot. and fragm. Gr.); also *Linden*, no. 464 (Gr., Univ. Geneva). This material secured by Linden bears his Caracas label but error is suspected since the species not otherwise known from the coast of Venezuela is abundant in parts of Colombia traversed by this collector.

E. UBER Robinson, Proc. Am. Acad. lv. 37 (1919). After publish-

ing this Peruvian plant, which had been carefully differentiated from other Andean species of the genus, the writer noticed its likeness to *E. rufescens* Lund of Atlantic Brazil. This resemblance, though striking, did not appear to reach specific identity.

It has recently been possible, through the kindness of Capt. John Donnell Smith, of Baltimore, to borrow from his herbarium a sheet of excellent Brazilian material of *E. rufescens*. This, carefully compared at the Gray Herbarium with a fragment of the type of *E. uber*, discloses the following differences.

E. rufescens: leaves tomentose beneath; inflorescence distinctly pyramidal; involucral scales 3.5–4 mm. long, soft in texture, dorsally tomentose except for the hyaline margin, also sometimes glandular-atomiferous; achenes glabrous or merely with minutely scabrid angles (sometimes with a few scattered sessile glands).

E. uber: leaves finely and somewhat sparsely pubescent beneath; inflorescence flattish or only moderately convex; involucral scales 4.5–5 mm. long, of firmish texture, dorsally granular and very sparingly puberulent; achenes setulose.

These distinctions, while none of them strong, are in combination sufficient to make probable the distinctness of these species, especially as they are separated by such distance and belong to floras in general so different as those of the Andean portions of Peru and the coastal parts of Brazil.

E. (§ **Subimbricata**) **variolatum**, spec. nov., ut videtur herbaceum perenne 3–4 dm. altum erectum pluricaule a caudice paullo lignescenti; caulibus gracilibus teretibus rectis virgatis 1–2 mm. diametro griseo-puberulo a basi ad inflorescentiam foliosissimis; foliis alternis sessilibus lineari-spatulatis crassiusculis integerrimis apice obtusiusculis 3–7 mm. longis 0.4–1.1 mm. latis supra subglabris subtus sparse griseo-puberulis utrinque quasi variolatis cum glandulis (post exsiccationem) depressis; foliis primariis fere omnibus proliferis et in axillis folia plura paullo minora gerentibus; corymbo terminali alternirameo convexo multicapitulato griseo-tomentello; pedicellis filiformibus ca. 2 mm. longis; capitulis ca. 5-floris ca. 6 mm. altis et 4 mm. diametro; involucri squamis ca. 11 valde inaequalibus 2–3-seriatis erubescentibus griseo-tomentellis, exterioribus 4–5 lanceolatis subacutis 1–2 mm. longis, interioribus elliptico-oblongis conspicue ciliatis 3–4.5 mm. longis 1.7 mm. latis; corollis ut videtur rubritinctis ca. 3.5 mm. longis paullo granulatis, tubo proprio ca. 1 mm. longo, faucibus subcylindratis paullo ampliatis ca. 2 mm. longis, dentibus limbi ca. 0.6 mm. longis; achaeniis glabris crassis vix 1.5 mm. longis sublucidis brunneis; pappi setis ca. 40 albidis barbellatis.—Brazil: Prov. St.

Paul and Rio Grande do Sul, *Auguste de Saint-Hilaire*, no. 871 Catalogue C² No. 1553 (TYPE, Par., phot. and small fragm. Gr.).

E. variolatum forms a new member of the little series *Disynaphia* (Hook. & Arn.) Bak. In this group it differs from *E. ericoides* DC. and *E. angustissimum* Spreng. by its obtuse puberulent and pitted leaves; from *E. calyculatum* Hook. & Arn. (*Stevia calycina* DC. and *Disynaphia monteridensis* DC.) in its smaller heads, elliptical and obtuse inner involucral scales, very small leaves, etc., from *E. ligulaefolium* Hook. & Arn. (*E. gnidioides* DC.) and *E. spatulatum* Hook. & Arn. (*E. halimifolium* DC.) in its much smaller and less pubescent but (under lens) distinctly variolate leaves, from *E. multifolium* Robinson in its very much smaller, relatively narrower leaves, more open inflorescence and smaller heads.

In its characteristic habit *E. variolatum* recalls some species of *Petalostemon*. Two sheets of this species were found in a recent loan from the Paris Museum of Natural History sent to the writer for study and identification. While both were from the collection of Auguste de Saint-Hilaire and bore identical numbers, one had the label form for "Province de Saint-Paul" and the other for "Province de Rio Grande do Sul." It seems probable that the material, which is identical in form, development and condition from drying, was collected at one time and place, and that one of the labels was correct and the other used by error. The species is so characteristic that its recognition on rediscovery should not offer any difficulties.

Mikania (§ **Spiciformes**) **aquaria**, spec. nov., robusta scandens; caulibus teretibus ad 12 mm. diametro usque ad inflorescentiam glabris fistulosis et cum aqua impletis post exsiccationem multicostulatis; ramis oppositis patentibus; internodiis 2 dm. vel ultra longitudine; foliis oppositis ovatis acuminatis integris basi vel profunde cordatis vel subtruncatis et cum acumine in petiolum paullo decurrentibus subcoriaceis supra atroviridibus impresse reticulatis lucidulis glaberrimis subtus pallidioribus opacis olivaceis minutissime pulverulenti-puberulis prope basin palmatim vel pinnatim 5–9-nervatis 20–23 cm. longis 15–17 cm. latis; petiolo 7–9 cm. longo; paniculis magnis lateralibus vel terminalibus 1.5–4 dm. altis 1–3 dm. diametro foliaceo-bracteatis crispe puberulis; bracteis ovatis vel ovato-oblongis utroque acutatis 3–8 cm. longis 1.5–4 cm. latis petiolatis; spicis laxis 3–7 cm. longis; rhachi gracili plerumque leviter curvata; capitulis sessilibus late patentibus vel divaricatis; bracteolis ovatis acuminatis ciliatis ca. 1.6 mm. longis; involucri squamis anguste oblongis ciliolatis apice rotundatis et mucronulatis ca. 3.8 mm. longis et 1.2 mm. latis 3–5-nervatis; flosculis fragrantibus; corollis glabris albis; tubo proprio

ca. 2 mm. longo apice sensim constricto; faucibus anguste turbinatis ca. 1.5 mm. longis; dentibus limbi deltoideis 0.5 mm. longis; achaeniis nigrescentibus 2.6 mm. longis scabridulis; pappi setis ca. 36 sordide albidis vix apicem versus incrassatis ca. 3.8 mm. longis.—PERU: a liana with succulent hollow and water-filled stems, growing on the montaña along open stream, alt. about 610 m., Aug. 10–24, 1923, *J. F. Macbride*, no. 5242 (TYPE, Field Mus.; ISOTYPE, Gr.). A well marked species, probably related to the Bolivian *M. cinnamomifolia* Lingelsh. and *M. dioscorcoides* (Rusby) Robinson, but having larger heads and different foliage.

M. (§ **Thyrsigerae**) **cryptodonta,** spec. nov., volubilis subherbacea glabriuscula; caule subtereti post exsiccationem purpurascenti-brunneo flexuoso pluricostulato primo obscure puberulo; internodiis 1–2 dm. vel ultra longitudine; foliis oppositis graciliter petiolatis ovatis acuminatis basi subtruncatis vel late subcordatis vel distincte cordatis margine revolutis remote obscureque cuspidato-dentatis (dentibus vix 0.2 mm. altis 5–10 mm. inter se distantibus) membranaceis 8–14 cm. longis et 5–10 cm. latis a basi subpalmatim 5-nervatis utrinque obscurissime in nervis sordide puberulis aliter glabris subtus paullo pallidioribus; petiolo 3–4.5 cm. longo puberulo, eis ejusdem jugi ab annulo prominulenti conjunctis; paniculis pyramidatis laxiusculis axillaribus pedunculatis 1.5–2 dm. longis ca. 1 dm. diametro; capitulis 8–9 mm. longis ad apices ramulorum irregulariter subcymosis aliis subsessilibus aliis graciliter pedicellatis; pedicellis 0.5–3 mm. longis; bracteolis oblanceolato- vel spathulato-linearibus; involucri squamis lineari-oblongis obtusis apice puberulis; corollis albidis glabris ca. 5 mm. longis; tubo proprio gracili 2.3–2.7 mm. longo; faucibus campanulatis 1.2–1.4 mm. altis; dentibus limbi deltoideis 1–1.3 mm. longis; achaeniis gracilibus fuscis minutissime scabratis deorsum attenuatis 3.2–4 mm. longis; pappi setis ca. 36 albidis apicem versus non incrassatis 4.5–5 mm. longis.— PERU: herbaceous or nearly so, clambering over stumps or in sunny woods, about 610 m. alt., Pozuzo, June 20–22, 1923, *J. F. Macbride*, no. 4683 (TYPE, Field Mus.; ISOTYPE, Gr.), and no. 4552 (Field Mus., Gr.). Most nearly related to *M. decora* Poepp., but differing in its thinner smoother more deltoid-ovate rather than oblong leaves, longer petioles and cymose rather than racemoid disposition of the heads in the inflorescence.

M. DECORA Poepp. in Poepp. & Endl. Nov. Gen. ac Spec. iii. 53 (1845). Material with the technical characters of *M. decora* but differing clearly in several minor features may be varietally appended to this species and distinguished from the typical variety as follows:

Var. **typica**, foliis subtus distincte in nervis puberulis; nervis

lateralibus ab costa saepuis ca. 5–8 mm. supra basin divergentibus; petiolo ca. 1.5 cm. longo.

Var. **heteroneura**, var. nov., foliis (ad maturitatem) subtus glabris; nervis lateralibus 3-jugis distincte pinnatis, jugo tertio 1.5–2.5 cm. supra basin oriente; petiolo 2–2.5 cm. longo.—PERU: liana with greenish flowers and pinkish pappus, Villacabamba, Hacienda on Rio Chinchao, alt. about 610 m., July 17–26, 1923, *J. F. Macbride*, nos. 5167 (TYPE, Field Mus.; ISOTYPE, Gr.) and 5191 (Field Mus., Gr.). The distance of the upper pair of lateral nerves from the leaf-base is so great that the leaf becomes truly pinnate-veined. The leaves also are somewhat less sharply acuminate than in the typical variety and the cross-veining between the nerves is less regular.

M. (§ **Corymbosae**) **Gleasonii**, spec. nov., volubilis elata verisimiliter fruticosa saltim suffruticosa inflorescentiis exceptis aspectu glaberrima; caule leviter hexagono post exsiccationem pluricostulato glabro 3–4 mm. vel ultra crasso; internodiis usque ad 14 cm. longis; foliis oppositis petiolatis oblongis acuminatis integris basi acutis vel subobtusis paullo supra basin pinnatim 5-nervatis supra nitidis lucidis impresse reticulatis subtus concoloribus minutissime obscureque puberulis 9–15 cm. longis 4–7 cm. latis coriaceis margine revolutis; petiolo 2–2.5 cm. longo plerumque curvato supra canaliculato, eis ejusdem jugi ab annulo prominulento obscuro transverso conjunctis; bracteis foliaceis petiolatis; corymbis saepe binis vel trinis ex eodem axillo graciliter pedunculatis valde inaequalibus (verisimiliter partialibus in corymbo arcte sessili) 4–6 cm. diametro laxis valde convexis fusco-puberulis conjunctim inflorescentiam terminalem interruptam paniculatam ad 2.5 dm. vel ultra longitudine formantibus; pedicellis plerisque 4–8 mm. longis; bracteolis lanceolatis vel anguste oblongis 3–4 mm. longis plerumque ad vel prope summam partem pedicelli orientibus; capitulis ca. 9 mm. longis; involucri squamis anguste oblongis 7–8 mm. longis 1.3–1.6 mm. latis apicem versus minutissime puberulis aliter glabris brunneis; corollis glabris (immaturis) ca. 5 mm. longis tubulatis paullo sursum ampliatis sine faucibus distinctis in parte superiori vinaceo-purpureis; dentibus limbi ca. 0.8 mm. longis; achaeniis valde immaturis glabris ca. 2.8 mm. longis; pappi setis ca. 50 albidis ca. 5 mm. longis vix sursum incrassatis.—BRITISH GUIANA: dense upland forest, Rockstone, July 15–Aug. 1, 1921, *Dr. H. A. Gleason*, no. 681 (TYPE, in herb of N. Y. Bot. Gard., sk. and fragm. Gr.). A well marked species with thick shining leaves recalling those of many *Lauraceae*. In inflorescence this species is somewhat vaguely intermediate between § *Corymbosae* and § *Thyrsigerae*, its apparently sessile corymbs being

loose and very convex and disposed along the branches so as to form a lax and interrupted panicle. It is a pleasure to commemorate in the naming of this species the very notable work accomplished by its collector in the exploration of British Guiana.

M. INCASINA Robinson, Contrib. Gray Herb., n. ser. lxiv. 11, 82 (1922). This species has hitherto been known only from the original material collected by Alexander Mathews eighty or ninety years ago. It was scarcely in anthesis and showed only the upper, probably rameal leaves. Specimens which appear to be specifically identical have recently been collected by Mr. J. F. Macbride (no. 5778, Field Mus., Gr.) on sunny brush at La Merced, Hacienda Schunke, Peru, alt. about 1220 m. These are in advanced anthesis and exhibit not merely the rameal but the considerably larger cauline leaves which are rounded at the sides of the base but have the same narrowly deltoid-ovate form. They are sometimes as much as 18–22 cm. long and 9–10 cm. wide with petiole 4 cm. long; the floral characters agree closely with those of the type though from greater maturity the dimensions are somewhat larger than those described in the original characterization. A noticeable trait is found in the tendency of the mature involucral scales to bend rather sharply backward and outward at the point where the deltoid tip begins. This spreading tip appears to be of softer texture than the rest of the scale, which in full maturity becomes firmish in character.

M. NIGROPUNCTULATA Hieron., var. **denticulifolia**, var. nov., foliis margine distincte cuspidato-denticulatis; dentibus ca. 0.5 mm. altis plerisque 2–9 mm. inter se distantibus; aliter var typicae similis. —COLOMBIA: Dept. of El Cauca: climbing shrub in bushy forest, alt. 2400–2700 m., Cordillera Occidental, June 28, 1922, *Pennell & Killip*, no. 7430 (Gr.).

M. (§ **Globosae**) **hesperia**, spec. nov., fruticosa volubilis; caule subtereti post exsiccationem costato patenter piloso vel subsetoso et dense cum glandulis nigrescentibus globosis sessilibus vel brevissime stipitatis ornato ca. 3 mm. vel ultra diametro; internodiis plerisque 4–5 cm. longis; foliis oppositis breviter petiolatis oblongo-lanceolatis attenuato-acuminatis basin versus gradatim angustatis sed ad basin veram abrupte rotundatis penniveniis margine cuspidato-denticulatis (dentibus ca. 0.4 mm. altis et 5–7 mm. inter se distantibus) membranaceis utrinque viridibus supra in costa obscure puberulis subtus in costa et nervis principibus appresso-pilosis in superficie minute nigropunctatis utrinque prominenter reticulato-venosis 12–14 cm. longis 2.5–4 cm. latis; petiolo crasso setoso-piloso fuscescenti 4–5 mm. longo; panicula terminali 1–1.5 dm. longo vix 4 cm. diametro

(immatura) oppositiramea setoso-pilosa; ramis paniculae adscendentibus brevibus a bracteis foliaceis multo superatis; capitulis ca. 8 mm. longis subsessilibus in glomerulos subglobosos ca. 2 cm. diametro dispositis; bracteolis subherbaceis pilosis nigropuncticulatis ca. 2–3 mm. longis et 1.5 mm. latis; involucri squamis oblongis obtusis apicem versus puberulis et saepissime nigropunctatis ca. 4–4.5 mm. longis et 1.2–1.3 mm. latis; corollis purpureis ca. 4 mm. longis; tubo proprio gracili ca. 1.5 mm. longo; faucibus subcylindrato-campanulatis ca. 1.5 mm. longis; dentibus limbi ca. 1 mm. longis; achaeniis (valde immaturis) glabris 2 mm. longis non punctatis; pappi setis ca. 25 albis.—COLOMBIA: Dept. of El Cauca; in bushy forest, "San José," San Antonio, Cordillera Occidental, alt. 2400–2700 m., June 28, 1922, *Pennell & Killip*, no. 7430 (TYPE, Gr.).

This plant, at first suspected to be a variety of *M. nigropunctulata* Hieron., is found to differ from that species (of which a photograph of the type has recently been obligingly supplied to the writer from the Botanical Museum at Berlin) in the following points: its leaves are longer and relatively much narrower, their margins instead of being entire are distinctly denticulate, they are more regularly feather-veined and the veinlets instead of being impressed are prominulent on the upper surface; the internodes are shorter, not exceeding 4–6 cm., and the petioles are scarcely half as long as in *M. nigropuncticulata*. The corollas are deep purple while Hieronymus states the flowers of *M. nigropuncticulata* to be "cinereo-albidi." *M. lanceolata* Hieron. of Ecuador with somewhat similar habit is a smoother plant with entire subcoriaceous less gradually attenuate leaves and somewhat more loosely spreading inflorescence, the branches equalling or exceeding the subtending bracts.

M. (§ **Thyrsigerae**) **Hitchcockii**, spec. nov., fruticosa reclinans; ramis elongatis teretibus dense fulvescenteque villoso-tomentosis 4 mm. vel ultra crassis; internodiis usque ad 14 cm. longis; foliis oppositis petiolatis ovatis vel ovato-oblongis gradatim acuminatis obsolete cuspidato-dentatis (dentibus obscuris brevissimis 4–13 mm. inter se distantibus) basi late rotundatis paullo supra basin pinnatim vel subpalmatim 5(–7)-nervatis membranaceis supra juventate appresse villosis maturitate (nervis villosis exceptis) glabratis prominulenter reticulatis subtus fulvescente villoso-tomentosis 11–13 cm. longis 5.5–6.5 cm. latis; nervis per venas transversas subparallelas conjunctis; petiolo 2–2.5 cm. longo dense fulvescenteque tomentoso; paniculis axillaribus oppositis vel terminalibus longe pedunculatis ovoideo-pyramidatis oppositirameis 1–2.5 dm. altis 12–20 cm. crassis; bracteis linearibus dense sericeo-velutinis 3–10 mm. longis; capitulis ca. 4 mm. altis

graciliter pedicellatis in ramulis ultimis subracemose dispositis; pedicellis plerisque 1.5–2 mm. longis; bracteolis lanceolatis ca. 1 mm. longis ad basin pedicelli affixis; involucri squamis anguste oblongis maturitate brunneis apice rotundatis vix nervatis apicem versus dorsaliter puberulis et margine ciliatis aliter glabris; corollis albis ca. 2.5 mm. longis; tubo proprio ca. 1 mm. longo gracili; faucibus modice ampliatis subcylindratis ca. 1–1.2 mm. longis; dentibus limbi ca. 0.4 mm. longis; achaeniis (immaturis) atrobrunneis glabris ca. 2 mm. longis; pappi setis ca. 30 corollas subaequantibus albidis.—ECUADOR: Prov. Tungurahua: Valley of the Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,818 (TYPE, Gr.).

This species has rather closely the habit of the widely distributed Cordilleran *M. Ruiziana* Poepp., but differs in having decidedly smaller heads and florets, and in having the bractlets borne at the base of the pedicel and not as in *M. Ruiziana* at the summit and closely subtending the head.

M. (§ **Thyrsigerae**) **inornata**, spec. nov., volubilis verisimiliter fruticosa glabra; caule hexagono ad 5 mm. diametro; internodiis 5–23 cm. vel ultra longitudine; ramis flexuosis tortis; foliis oppositis oblongo-ovatis acuminatis basi acutis vel subrotundatis margine integerrimis vel obscure remoteque undulato-dentatis utrinque glaberrimis viridibusque concoloribus textura subcarnosis prope basin pinnatim 5-nerviis 8–11 cm. longis 3–6 cm. latis; petiolo 2–4 cm. longo, eis ejusdem jugi basi ab annulo suberoso prominenti transverso conjunctis; appendicibus stipuliformibus nullis; panicula laxa interrupta ramosa elongata; inflorescentiis partialibus breviter pedunculatis patentibus 5–20-capituliferis corymbiformibus 2–4 cm. diametro subdensis; bracteis ovatis 1–3 cm. longis; bracteolis oblongo-ovatis herbaceis ciliatis acutis involucrum subaequantibus ad apicem pedicelli orientibus; pedicellis gracilibus plerisque ca. 2 mm. longis; involucri anguste ovoidei squamis oblongis vix acutatis obscure plurinerviis ca. 6 mm. longis 1.6–2 mm. latis erosis glabris; corollis viridescentibus ca. 5 mm. longis glabris; tubo proprio ca. 2.5 mm. longo basin versus paullo constricto; faucibus brevissimis campanulatis; dentibus limbi oblongis acutiusculis ca. 1.8 mm. longis et 0.8 mm. latis; achaeniis griseis maturitate crassiusculis glabris ca. 3 mm. longis; pappi setis numerosis ca. 100 carneo-albidis corollam maturitate superantibus.—PERU: "on sunny shrubs," alt. about 1067 m., July 19–25, 1923, *J. F. Macbride*, no. 5061 (TYPE, Field Mus.; ISOTYPE, Gr.). In its slightly fleshy or succulent character recalling *M. carnosa* Muschler and *M. montana* described below, but differing from both in its hexagonal

branches, much larger leaves, broader involucral scales, stouter achenes, and in the disposition of its heads in an elongated loose panicle with much less corymbose tendency, a feature which imposes the necessity of placing the species in § *Thyrsigerae*. Flowers said to be greenish.

M. (§ **Thyrsigerae**) **lasiopoda**, spec. nov., fruticosa scandens; caulibus flexuosis tortis lignescentibus medullosis teretibus 4–5 mm. diametro praecipue nodos versus subsetoso-pubescentibus aliter maturitate subglabratis sed scabratis post exsiccationem leviter costulato-angulatis; internodiis ad 2 dm. vel ultra longitudine; ramis oppositis patentibus; foliis lanceolato-oblongis attenuatis integris basi angustatis distincte cordatis (vel apud folia ramea rotundatis vel obtusis) pinnatim nervatis vel subregulariter penniveniis supra glabris lucidulis minute impresseque reticulatis post exsiccationem fuscescentibus subtus laxe sordideque pubescentibus olivaceis minute punctatis firmiter membranaceis 8–14 cm. longis 3–5.5 cm. latis; petiolo brevissimo robusto dense setoso-piloso 1–4 mm. longo; eis ejusdem jugi basi annulo obscuro plus minusve incrassato setoso transverse conjunctis; paniculis ramos terminantibus ovoideo-pyramidatis 1.5–3 dm. longis 8–15 cm. diametro sordide pubescentibus; pedicellis gracilibus plerisque 1–3 mm. longis; bracteis bracteolisque ovato-lanceolatis acutis laxe pilosis parvis; involucri squamis anguste oblongis subacutis 3.5 mm. longis ca. 1 mm. latis maturitate subglabris tenuibus brunnescentibus; corollis glabris, tubo proprio gracili ca. 1.5 mm. longo; faucibus campanulatis ca. 1.4 mm. altis; dentibus limbi deltoideis ca. 0.7 mm. longis; achaeniis gracilibus glabris deorsum decrescentibus acute angulatis fusco-griseis ca. 1.7 mm. longis; pappi setis ca. 37 tenuibus albis sublaevibus corollam subaequantibus.—PERU: a "liana of montaña river-slope," with flowers odorless and whitish, alt. about 1220 m., Aug. 10–24, 1923, La Merced, *J. F. Macbride*, no. 5567 (TYPE, Field Mus.; ISOTYPE, Gr.); also "on sunny brush," flowers dirty-greenish, alt. about 1220 m., Aug. 27 to Sept. 1, 1923, La Merced, Hacienda Schunke, *J. F. Macbride*, no. 5729 (Field Mus., Gr.). This species keys out to the neighborhood of *M. lancifolia* Robinson but differs in having broader thinner leaves which are sublucid above and (at least the cauline) distinctly cordate at the narrowed base; furthermore its involucral scales are more obtuse, its panicle less leafy, and its achenes shorter than in *M. lancifolia*. There can be no doubt that it is a distinct species. The name, of course, alludes to the shaggy petioles.

M. (§ **Thyrsigerae**) **Macbridei**, spec. nov., fruticosa verisimiliter scandens vel in fruticetis inclinans robusta; caule 6–8 mm. crasso

tereti a basibus pilorum delapsorum quasi granulato-scabrato; ramis oppositis patentibus griseo- vel albido-lanatis; internodiis 8–14 cm. longis; foliis oppositis, caulinis ovatis acutis integris vel obscure undulato-dentatis (dentibus 1–1.5 cm. inter se distantibus) basi rotundatis textura coriaceis supra maturitate glaberrimis viridibus rugulosis subtus niveo-tomentosis pinnatinerviis 1.6–2 dm. longis 8–12 cm. latis; nervorum jugis principibus 2–3 supra basin 1–40 mm. orientibus prorsus curvatis supra sulcatis subtus prominentibus; petiolo 2.8–3.5 cm. longo dense albo-tomentoso, eis ejusdem jugi basi ab annulo crasso conjunctis; foliis rameis ovato-oblongis 7–10 cm. longis 3.5–6 cm. latis; paniculis ramos terminantibus ovoideis magnis oppositirameis 2.5–3 dm. longis 1.5 dm. crassis divaricatim ramosis albo-tomentellis; capitulis ad apices ramulorum plerisque binis vel ternis subsessilibus ca. 8 mm. longis; involucri squamis oblongis ca. 4 mm. longis 1–1.4 mm. latis apice rotundatis dorso subsericeo-puberulis maturitate rigidiusculis; corollis glabris pallide viridibus ca. 4 mm. longis; tubo proprio gracili ca. 1.5 mm. longo; faucibus campanulatis ca. 1.5 mm. longis; dentibus limbi ca. 1 mm. longis deltoideis; achaeniis gracilibus fusco-griseis glabris deorsum decrescentibus 3.2–3.7 mm. longis; pappi setis ca. 30 sordide albidis corollam subaequantibus.—PERU: "on sunny brush, flowers light green," alt. about 1220 m., Aug. 27–Sept. 1, 1923, *J. F. Macbride*, no. 5728 (TYPE, Field Mus.; ISOTYPE, Gr.).

Available material of this very well marked species is rendered the more striking from the fact that all but the youngest leaves are covered beneath by a very curious white porous veil-like coating which on examination by my cryptogamic colleagues, Thaxter and Dodge, proves to be undoubtedly a fungus-mycelium. Unfortunately no fruiting portions have been found and identification is impossible. This close membranelike network completely covers and obscures the normal pubescence in the mature leaves without however greatly changing the shade, for both are a very light gray, in fact nearly white. The *Mikania* seems to have developed normally and to have matured well ripened achenes notwithstanding the presence of the fungus, which appears to be confined to the lower leaf-surface.

M. Macbridei may perhaps be best placed next or at least near to *M. lanuginosa* DC. but differs from that species in its subsessile heads which are cymose rather than subracemose in disposition, and in its leaves which are larger, firmer, rounded at the base and nearly glabrous above.

In naming this striking species it is a pleasure to commemorate Mr. Macbride's notable progress in the exploration of the Peruvian flora.

M. (§ **Corymbosae**) **montana**, spec. nov., scandens paullo lignescens infra inflorescentiam glaberrima; caule tereti articulato ca. 4 mm. diametro flavido-brunneo laevi; internodiis 2–4 cm. longis; nodis ab annulo prominulo suberoso tenui circumcinctis; foliis oppositis petiolatis ovatis glaberrimis carnosis acutis basi rotundatis et breviter ad insertionem petioli acutatis a basi 5–7-nervatis subtus paullo pallidioribus impresse reticulato-venosis margine utroque distanter 1–4-cuspidato-dentatis 3–5 cm. longis 1.5–3 cm. latis; petiolo ca. 1.5 cm. longo gracili glabro, eis ejusdem jugi ad basin annulo conjunctis; corymbis terminalibus et lateralibus trichotomis ca. 8 cm. diametro conjunctim paniculam laxam foliaceo-bracteatam formantibus granuloso-puberulis; bracteis superioribus ovatis acuminatis ca. 1 cm. longis; bracteolis oblongis acutis a summa parte pedicelli orientibus et involucrum aequantibus; pedicellis gracilibus 3–4 mm. longis; capitulis plerisque in cymulos 3-capituliferos symmetrice dispositis 1 cm. longis; involucri squamis herbaceo-substramineis oblongis obtusis vel acutiusculis apice ciliatis dorso glabris vel apicem versus puberulis ecostatis basi paullo calloso-incrassatis; corollis gracillimis glabris; tubo proprio 3 mm. longo; faucibus brevissimis ca. 0.5–0.7 mm. longis; dentibus limbi linearibus ca. 3.5 mm. longis et 0.6 mm. latis; achaeniis glabris gracilibus 4.5 mm. longis; pappi setis ca. 80 inaequalibus plerisque 4.5–5 mm. longis albidis vix scabratis.—PERU: a liana on shrub-montaña, Huacachi near Muña, alt. about 1982 m., May 20–June 1, 1923, *J. F. Macbride*, no. 4169 (TYPE, Field Mus., phot. and fragm. Gr.). This slightly succulent species somewhat recalls *M. carnosa* Muschler, but differs in having its bractlets equal to the involucre instead of one-half its length, involucral scales obtuse instead of acute, corolla-lobes much longer and throat much shorter, and leaves (triangular rather than rhombic-ovate) remotely cuspidate-dentate. In many of its characters *M. montana* resembles the Brazilian *M. involucrata* Hook. & Arn. but that has firmer unreticulated leaves, broader and obtuse or rounded bractlets, and denser inflorescence.

M. (§ **Corymbosae**) **pastazae**, spec. nov., volubilis ut videtur herbacea verisimiliter perennis (basi ignota); caulibus saltim ramis hexagonis ca. 2 mm. crassis post exsiccationem costulatis; internodiis plerisque 5–12 cm. longis; foliis oppositis ovatis integris acuminatis basi gradatim vel abruptius angustatis vel subrotundatis et ad insertionem petioli breviter acuminatis usque ad 8 cm. longis et 4 cm. latis paullo supra basin 3-nervatis utrinque glabris membranaceis; petiolis ca. 2 cm. longis supra canaliculatis, eis ejusdem jugi ab linea paullo prominenti conjunctis; corymbis numerosis oppositis pedunculatis 6–12 cm. diametro planiusculis vel convexis vel valde rotunda-

tis apicem caulis versus inflorescentiam magnam compositam foliaceo-bracteatam formantibus; ramulis ultimis et pedicellis sordide puberulis; capitulis ca. 1 cm. longis 5 mm. diametro sessilibus vel breviter pedicellatis; bracteolis ovatis acuminatis 3-nerviis ca. 6 mm. longis 3 mm. latis; involucri squamis anguste lanceolato-oblongis subacutis ca. 8.5 mm. longis et 2 mm. latis dorso tenuiter striato-costulatis glabris apicem versus paullo patentibus; corollis glabris albis; tubo proprio 2.5 mm. longo gracili; faucibus campanulatis ca. 1–1.2 mm. altis; dentibus limbi ovatis ca. 1.7 mm. longis; achaeniis glabris griseis vel olivaceis vel brunnescentibus ca. 3 mm. longis deorsum decrescentibus; pappi setis sordide albidis ca. 80 capillaribus apicem versus non incrassatis sublaevibus.—ECUADOR: Province Tungurahua; Valley of Pastaza River between Baños and Cashurco, 8 hours east of Baños, alt. 1300–1800 m., Sept. 25, 1923, *Prof. A. S. Hitchcock*, no. 21,875 (TYPE, Gr.).

M. PUNCTATA Klatt. Bull. Soc. Bot. Belg. xxxi. 195 (1893). This species, hitherto known from Southern Mexico to Venezuela and Bolivia, seems never to have been recorded from Peru. It has now been found by Mr. Macbride at two Peruvian stations, namely La Merced, on a sandy valley floor, alt. about 610 m., Aug. 10–24, 1923, no. 5461 (Field Mus., Gr.) and "on sunny shrubs," alt. 1040 m., at Pampayacu, Hacienda at mouth of the Chincao River, July 19–25, 1923, no. 5062 (Field Mus., Gr.); also in less characteristic form as a liana on trees of open wood at about 1220 m., Rio Huallago Cañon below Rio Santo Domingo, June 3, 1923, no. 4219 (Field Mus., Gr.). The last mentioned specimen, while agreeing with the species in important features, has leaves rounded rather than cordate at base and obtusely angled rather than lobed laterally. It appears, however, to be only a leaf-variant. Indeed the leaves are chiefly those in or very near the inflorescence and similar though smaller floral leaves may be sometimes found on the more northern material of the species.

M. (§ **Thyrsigerae**) **rivularis**, spec. nov., fruticosa vel vix lignescens scandens glabra; caulibus teretibus fusco-brunneis post exsiccationem multicostulatis; internodiis 9–17 cm. longis; foliis oppositis oblongis longe acuminatis integerrimis margine revolutis basi acutis utrinque glabris subtus paullo pallidioribus minute papillosis supra basin 3-nervatis (cum venis 2 obscuris intra-marginalibus) 9–11 cm. longis 3–4 cm. latis membranaceis; petiolo 1–2.2 cm. longo; paniculis axillaribus et terminalibus oppositirameis foliaceo-bracteatis; capitulis ca. 9 mm. longis in glomerulis globularibus ca. 3 cm. diametro dispositis, capite terminali arcte sessili, lateralibus distincte pedicellatis pedicellis 1–3 mm. longis; bracteolis ovato-lanceolatis acuminatis

2.5 mm. longis ca. 0.9 mm. latis; involucri squamis ovato-oblongis apice rotundatis ciliolatis ca. 4.8 mm. longis 1.2 mm. latis dorso glabris leviter costulatis; corollis ca. 6 mm. longis glabris; tubo proprio 2.5 mm. longo; faucibus cylindratis vix ampliatis 3 mm. longis; dentibus limbi acutis deltoideis patentibus 0.5 mm. longis; achaeniis maturis 2 mm. longis crassiusculis argute angulatis griseo-olivaceis glaberrimis lucidis; pappi setis rubellis ca. 45 apice paullo incrassatis obtusis penicillatis.—PERU: liana-like, on stream-brush; flowers white, turning greenish, about 610 m. alt., Aug. 10–24, 1923, *J. F. Macbride*, no. 5414 (TYPE, Field Mus.; ISOTYPE, Gr.).

This species in foliage has some resemblance to *M. Stuebelii* Hieron. but that has a different inflorescence (the lateral as well as the terminal heads being subsessile), longer and pubescent achenes, less blunt pappus-setae and other differences.

II. NEW PLANTS OF PORTUGUESE WEST AFRICA COLLECTED BY MRS. RICHARD C. CURTIS.

BY I. M. JOHNSTON.

THE species here described are a part of an excellently prepared and very interesting collection of African plants made by Mrs. Richard C. Curtis, of Boston, during the summer of 1923, when accompanying her husband as well as his father, Mr. Charles P. Curtis, and brother, Mr. Charles P. Curtis, Jr., on a hunting trip to the interior of Kenya Colony and Angola. The plants are not only carefully chosen and well preserved, but are accompanied by full ecological, habital and color notes. Hence they form a most welcome addition to the meager representation of the tropical African flora available in America.

The most interesting of the plants collected by Mrs. Curtis were those secured in central Angola, for here the expedition pene-trated a region which appears to have been previously unexplored botanically. A considerable part of the Angola collection was made in the range of the Giant Sable Antelope, between the Cuanza and Loando Rivers, about 100 miles south of their confluence. The party started from Dondé or Bella Vista, in Bailundo, near the end of the railroad east of Angola Bay, from there going by auto northwestward 120 miles to Capango. The march towards the Sabel Country started September 11th; the Cuanza River was crossed on the 14th, and a hunting camp formed on the 15th. The return march began September 22nd, and Capango was reached on the 26th,

the Cuanza having been crossed on the 24th. The Angola collection includes 311 numbers and was given by Mrs. Curtis to the Gray Herbarium. The Kenya collection is not as yet fully identified. So far as studied, it seems likely to contain many plants not previously represented in American herbaria, but relatively few, if any, that have not been scientifically described. Of the Kenya collection the ligneous plants have been deposited in the herbarium of the Arnold Arboretum and the herbaceous material, amounting to some 442 numbers, in the Gray Herbarium. Mrs. Curtis also made for the Gray Herbarium small collections during brief stops at Zanzibar, Mozambique, Lorenzo Marques, Walfisch Bay and Lüderitz Bay, containing characteristic plants of these localities.

Acrospira Curtisiae, sp. nov., glabra herbacea 20–24 cm. alta e cormo obliquo depresso 15–25 mm. crasso rugoso squamoso apicem versus radiculoso producta; foliis 3–5 linearibus nervosis 4–5 mm. latis; pedunculo foliis destituto gracili sulcato infra flores 13–15 cm. longo; racemo 8–10-floro simplici stricto 10–15 mm. crasso bracteis ovatis acuminatis scariosis instructo; floribus albis vel ochroleucis stricte et 2–6 mm. longe pedicellatis; perianthii lobis lanceolatis acutis ca. 10–11 mm. longis, exterioribus ca. 3 mm. latis in carina 3-nervatis; staminibus 6 subaequalibus, filamentis albis ca. 5 mm. longis linearibus, antheris luteis linearibus introrsis 4–4.5 mm. longis basifixis spiraliter convolutis basi profunde cordatis; capsula ovoidea lobata glabra 4–5 mm. crassa trivalva loculicide dehiscenti transverse delicateque undulato-rugosis; seminibus multis atris dense minute acuminate muriculatis irregulariter lobulatis ca. 2 mm. latis.—ANGOLA: east of the Cuanza River, Sept. 23, 1923, *Anita G. Curtis 333* (TYPE, Gray Herb.).—*Acrospira Curtisiae* differs from *A. asphodeloides* Welw., the other Angolan species, in its much smaller size, very much narrower leaves, and longer filaments; from *A. Laurentii* DeWild., of the Belgian Congo, it differs in lack of pubescence, narrow leaves, and much less developed bracts; while from *A. lilioides* Chev., of French Equatorial Africa, it may be readily distinguished by its narrower leaves and narrower lanceolate perianth-lobes. The plant has a depressed oblique corm with dark wrinkled and scarred surface bearing over the upper portion numerous fleshy, often fusiform, rootlets.

Brachystegia Russelliae, sp. nov., suffruticosa; caulibus pluribus rhizomate crassissimo lignoso erumpentibus 3–4 dm. altis subsimplicibus glaberrimis basi squamis imbricatis instructis; foliis paucis imparipinnatis 12–18 cm. longis 4–5 cm. latis glaberrimis 9–12-jugis 1.5–2 cm. longe petiolatis; foliolis coriaceis oppositis subsessilibus

glaberrimis oblongo-lanceolatis 6–11 mm. separatis 3–4.5 mm. longis 8–10 mm. latis superioribus paullo gradatim reductis apice obtuse rotundatis basi oblique truncatis vel subcordatis subtus paullo pallidioribus costa paullo excentrica; stipulis deciduis inconspicuis reniformi-deltoideis 3–4 mm. latis venosis; inflorescentia pauce laxeque ramosa 3–6 cm. longa ca. 3 cm. crassa fulvo-tomentulosa folio multo breviori; bracteis ovatis vel oblongo-ovatis 2–3 mm. longis deciduis, pedicellis 2–4 mm. longis tomentulosis; bracteolis obovatis ca. 6 mm. longis 4–4.5 mm. latis coriaceis extus tomentulosis apice rotundatis; sepalis 5 inaequalibus imbricatis oblongis vel ovatis 2–3 mm. longis 1–1.5 mm. latis pallidis conspicue dense fusco-ciliatis; petalis 3–5 inaequalibus filiformi-subulatis 0.5–1.5 mm. longis pallidis; staminibus 10–15 ca. 10–12 mm. longis glabris; ovario dense villoso ca. 2 mm. longe stipitato; legumine ignoto.—ANGOLA: locality uncertain, but probably from the Sable Country, *Anita G. Curtis 428* (TYPE, Gray Herb.).—This remarkable species is an undershrub with annual shoots from a woody rootstock and in that regard resembles the common habit of *Cryptosepalum*. In floral structures, however, the new species is clearly typical of *Brachystegia*, and I see no good reason for not considering it a member of that genus. It is noted that Burtt Davy & Hutchinson, Kew Bull. 1923, 130, in their recent revision of *Brachystegia* recorded no species with such a habit. Arborescent plants and undershrubs are accommodated, however, in the closely related *Cryptosepalum*. In the revision referred to, *B. Russelliae* keys out with *B. longifolia* Benth. of Nyasaland, a species which differs in its loosely branched arborescent habit, larger leaves, narrower bracteoles and sepals, and more stipitate, less villous ovary. FIG. 4.

At the request of Messrs. C. P. and R. C. Curtis this plant has been named in memory of the late Margaret P. (Mrs. Robert S.) Russell of Boston at whose suggestion the botanical collecting of the expedition was undertaken.

Cryptosepalum Curtisiorum, sp. nov., humilis; caulibus multis erectis simplicibus gracilibus e rhizomate crassissimo lignoso erumpentibus dense puberulentis fuscis 1–2 dm. altis basi a squamis latis scariosis instructis; foliis imparipinnatis breviter petiolatis 14–20-jugis 4–5(–9) cm. longis 15–25 mm. latis oblongis vel rare ovatis; rhachi puberulenta; foliolis subsessilibus oblongis vel lineari-oblongis 10–18 mm. longis 2–3(–4) mm. latis glaberrimis margine integerrimis et sparse ciliatis apice rotundatis vel obtusis basi obliquis; stipulis lanceo-linearibus scariosis 9–14 mm. longis libris; racemis terminalibus 10–25-floris 4–6 cm. longis 20–25 mm. crassis puberulentis, bracteis

obovato-oblanceolatis scariosis, pedicellis strictis 8–15 mm. longis; bracteolis petaloideis albis obovatis 5–8 mm. longis apice rotundatis extus puberulentis; petalo 1 oblongo vel obovato 5–8 mm. longo albo; staminibus 3 glabris; ovario compresso stipitato in lateribus glabro in marginibus plus minusve dense ciliato; legumine stipitato valde obliquo plano oblongo vel ovato 2–3 cm. longo glabro in margini superiori angustissime bialato.—ANGOLA: dry hard soil near Cuanza River, Sept. 13, 1923, *Anita G. Curtis 186* (TYPE, Gray Herb.); Giant Sable Country, east of Cuanza River, 900 m. alt., *Anita G. Curtis 207, 212, 271a, 281, 290.*—Closely related to *C. mimosoides* Welw., but readily distinguished by its more numerous flowers, better developed inflorescence, and much longer pedicels. This species is named in honor of Messrs. Charles P. Curtis and Richard C. Curtis, whose careful planning and skillful direction of their difficult journey into the interior of Angola rendered possible the discovery of the plants here described. It is learned that *Cryptosepalum Curtisiorum* is one of the plants chiefly grazed by the Giant Sable Antelope. FIG. 3.

Crotalaria bicolor, sp. nov., perennis; caulibus numerosis subsimplicibus strictis 15–25 cm. altis minute sulcato-striatis breviter villosis canescentibus e radice crassa orientibus; stipulis nullis; foliis trifoliolatis 2–5 mm. longe petiolatis, inferioribus gradatim reductis; foliolis lineari-oblanceolatis acutis, brevissime petiolulatis supra glabris subtus strigose pubescentibus, terminali 8–16 mm. longo 0.7–2.0 mm. lato; racemis terminalibus densiusculis 4–8 cm. longis 10–13 mm. crassis basem versus cum foliis normalibus bracteatis aliter minute setaceo-bracteatis; pedicellis ca. 3 mm. longis ascendentibus; calycibus 3–5 mm. longis, dentibus lanceolatis tubum excedentibus; corolla calycem fere duplo superante; carina flava 5–6 mm. longa margine inferiori rectangulari-inflexa inde in rostrum rectum attenuata; vexillo sparse pubescenti rubro-brunnescenti-lineato 5–6 mm. longo; ala flava brunnescenti-lineata; leguminibus obliqui-depresse globosis sessilibus erecto-pedicellatis 3–4 mm. longis monospermis sparse adpressi-pubescentibus.—ANGOLA: just east of Cuanza River, alt. 900 m., Sept. 18, 1923, *Anita G. Curtis 211* (TYPE, Gray Herb.), Giant Sable Country, alt. 900 m., Sept. 21, 1923, *Anita G. Curtis 252.*—Apparently related to *C. erythrophleba* Welw., but having smaller flowers with both standard and wings streaked with purple or reddish brown, more numerously flowered inflorescence leafy-bracted only at very base, inconspicuously pubescent larger leaves, and lower decidedly perennial habit. The plant has a strong, thick, deep taproot which distinguishes it from most of the other members of the

§ *Sphaerocarpae.* The keel and standard of the corolla are subequal. The keel is yellow, and the standard and wings are yellow with many longitudinal brownish-purplish lines. FIG. 2.

Indigofera latipinna, sp. nov., fruticosa erecta; caulibus pluribus ca. 4 dm. altis lignosis teretibus maturitate dilute brunnescentibus glabris basem versus 6 mm. crassis juventate adpresse villosis canescentibus; petiolis ca. 1 ca. longis canescenti-villosis; foliis imparipinnatis in rhachi breviter villosis canescentibus, primariis trifoliolatis ceteris quinque-foliolatis; foliolis integerrimis cuneato-obovatis 10–25 mm. longis 7–16 mm. latis ca. 1 mm. longe petiolulatis bicoloribus supra glaberrimis subtus dense canescenter tomentosis basi cuneatis apice truncatis vel late obcordatis vel retusis conspicue mucronatis, lateralibus oppositis, terminalibus paullo minoribus; stipulis lineari-lanceolatis 5–6 mm. longis deciduis; racemis 5–7 cm. longis axillaribus multifloris ascendibus quam folia paullo brevioribus vel ea paullo excedentibus; rhachi et pedicellis et calyce canescentibus adpresse villosis; floribus 0.5–1.0 mm. longe pedicellatis; calycis 15 mm. longi obliqui tubo brevi, dentibus obtusis deltoideis vel late ovatis; corolla calycem fere quadruplo superante ca. 12 mm. longa flavescenti vel ochroleuca; vexillo 9 mm. longo elliptico plicato apice rotundato brevissime unguiculato extus adpresse sparseque fusco-pubescenti quam carina multo breviori; alis lineari-oblongis ca. 8 mm. longis; carina 11–12 mm. longa acuta (in rostrum non producta); legumine ignoto.—ANGOLA: near Cuanza River, a day's march from Copango, Sept. 24, 1923, *Anita G. Curtis 360* (TYPE, Gray Herb.).—A member of Baker's group *Tinctoriae*, Jour. Bot. xxxii. 263 (1903), in which it is readily distinguished from most of the species by its woody stems and particularly by its few very large conspicuously bicolored leaflets. It is most nearly related to *I. rhynchocarpa* Welw. and *I. nambalensis* Harms, but differs from both in the number, size, outline and pubescence of the leaflets.

Aeschynomene Curtisiae, sp. nov., perennis herbacea ca. 4 dm. alta; caulibus erectis striatis paullo angulatis crasse sparseque hispidosetulosis stricte ramosis; stipulis lanceolatis acuminatis coriaceis paralleliter nervatis basi truncatis; foliis paucis strictis 10–12 mm. longe petiolatis 4–9 cm. longis ca. 1.7 cm. latis; rhachi compressa angulata glabrata; foliolis 8–20 oppositis vel rariter alternis coriaceis valde nervatis glabris 0.5–1.0 mm. longe petiolulatis oblongis vel elliptico-oblongis 15–20 mm. longis 4–6 mm. latis integerrimis apice rotundatis conspicue mucronatis basi obliquis subcordatis; panicula terminali laxa ca. 15 cm. crassa; pedicellis ascendentibus glabris 5–10 mm. longis; calycis glaberrimi 5 mm. longi labio superiori profunde

(ca. 1 mm.) emarginato 3–3.5 mm. lato ovato, labio inferiori integerrimo ca. 3 mm. lato obtuso; vexillo oblongo ca. 1 mm. longe unguiculatis, lamina 5 mm. longa 2 mm. lata flavescenti conspicue purpureo-nervata apice rotundata carinam subaequanti; alis flavis oblongo-lanceolatis acutis ca. 6–7 mm. longis 2 mm. latis 1 mm. longe unguiculatis quam petala cetera longioribus; carina 2.5 mm. lata flavescenti purpureo-nervata; ovario glabro stipitato 2-ovulato; legumine glabro valde compresso venoso saepe 2-loculato 10–14 mm. longe stipitato; loculis 7–9 mm. latis 10–14 mm. longis ca. 0.7 mm. crassis marginatis sed non alatis.—ANGOLA: Giant Sable Country, 900 m. alt., Sept. 23, 1923, *Anita G. Curtis 321* (TYPE, Gray Herb.).—Apparently most nearly related to *A. Baumii* Harms but glandless, much less pubescent, and with a lower herbaceous habit, entire lower calyx-lip, smaller flowers, and wingless pods. It is probably also related to *A. siifolia* Welw., but that has more pubescence and has many more leaflets. The new species is a handsome one because of its firm clean yellowish-green seemingly glabrous herbage, and loose panicles of small yellowish or ochroleucous flowers and later large conspicuously stipitate broad glabrous fruit. FIG. 1.

Dolichos linearifolius, sp. nov. perennis erectus 30–45 cm. altus; caulibus paucis herbaceis in sicco angulatis et striatis simplicibus vel ascendenter ramosis pallide viridibus sparse adpresseque villosis e radice crassa lignosa conico-fusiformi orientibus; stipulis triangulari-oblongis sessilibus glabris striatis subpersistentibus 4–5 mm. longis 2–4 mm. latis; foliis pinnatim trifoliolatis 8–16 mm. longe petiolatis, foliolis linearibus longitudinaliter trinerviis ca. 1 mm. longe petiolulatis basi cuneatis apice acutis juventate dense argenteo-villosis maturitate glabratis terminalibus usque ad 5 cm. longis et 6 mm. latis; inflorescentia ante folia evoluta vel cum foliis novellis vel nondum plane evolutis coaetanea; floribus 5–7 mm. longe pedicellatis in axillis bractearum vel foliorum fasciculatis; calyce campanulato sparse villoso 4–5 mm. longo irregulari, dentibus brevibus 2 superioribus in unum excisum connatis, lateralibus lanceolato-ovatis acutis, infimo ceteris paullo longiori lanceolato acuto tubo breviori; prophyllis 2 infra calycem insertis filiformibus 2–3 mm. longis; corolla glabrata 7–9 mm. longa (in sicco lilacea) calyce pluries longiori; vexillo suborbiculari emarginato ca. 1 mm. longe unguiculato 9–10 mm. lato; alis carinam paullo excedentibus oblique ca. 8 mm. longis; carina curvata obtusa ca. 3 mm. longe unguiculata, laminis 6 mm. longis; ovario lineari-lanceolato supra basin dilatato apicem versus attenuato apice 3–4 cm. longo ca. 8 mm. lato compressissimo.—ANGOLA: Between Cuanza and Loando Rivers, alt. ca. 900 m., Sept.

19–22, 1923, *Anita G. Curtis 230* (TYPE, Gray Herb.), *216*, *288*.—This species belongs to Harms's § *Trinerrati* and appears to be most nearly related to *D. trinervis* De Wild. of Katanga. It differs, however, in being less pubescent and in having snort calyx-lobes that do not surpass the length of the calyx-tube. FIG. 8.

Polygala congestiflora, sp. nov., annua herbacea; caule erecto striato in sicco atrato puberulo 4 dm. alto, ramis numerosis 10–15 cm. longis ascendentibus subsimplicibus angulatis floriferis; foliis numerosis oblanceolatis firmis integerrimis uninerviis glabratis concoloribus 1.5–2 cm. longis 3–4 mm. latis in sicco atropurpurascentibus apice breviter acuminatis basi attenuatis, racemis congestis subglobosis terminalibus 15 mm. crassis; bracteis ovato-deltoideis carinatis minutis deciduis; pedicellis angulatis 1–4 mm. longis; sepalo superiori ovato acuto 3-nervato 3 mm. longo glabro margine breviter denseque ciliato; sepalis anterioribus oblongis acutis ciliatis 3-nervatis glabris supra medium connatis 2.5 mm. longis; alis oblique ovatis ca. 8 mm. longis ca. 5 mm. latis flavis glabris basi abrupte lato-unguiculatis apice acutis margine basin versus inconspicue ciliatis; carina flavescenti 6 mm. longa ampla abrupte 1 mm. longe unguiculata; cristis plurifidis ca. 2 mm. longis; petalis superioribus obovato-oblongis ca. 3.5 mm. longis apice retusis basin versus abrupte breviter unguiculatis; antheris 6 oblongis glabris quam filamenta 4–6-plo brevioribus; filamentis glabris duobus interioribus sterilibus; stylo curvato glabro ca. 5 mm. longo apicem versus vaginato abrupte recurvo cucullato; stigmate refracto papilloso; ovario glabro oblongo-elliptico vix alato.—ANGOLA: vicinity of Capango, Sept. 27, 1923, *Anita G. Curtis 419* (TYPE, Gray Herb.).—A well marked species belonging in the "Subsect. *Deltoidea* § *Tetrasepala*" of Chodat. Its closest relation appears to be *P. Dekindtii* Gürke, from which it differs in its broader leaves, larger decidedly acute wings and oblong upper petals. Its style is almost exactly like that of *P. liniflora* Boj. and *P. acicularis* Oliv. as they are illustrated by Chodat, Monog. Polygal. t. 29, fig. 2 & 8 (1893). FIG. 5.

Triumfetta glabrata, sp. nov., herbacea perennis; caulibus numerosis erectis 20–35 cm. altis glabratis gracilibus in basi a squamis latis obtusis ornatis e radice crassa orientibus infra medium foliosis; foliis simplicibus 3–6 cm. longis 1.5–4 mm. latis anguste lanceolato-linearibus denticulatis subsessilibus acutis vel obtusis basin versus attenuatis subtus pallidioribus maturitate glaberrimis vel cum pilis stellatis paucis obtectis juventate canescentibus leviter stellato-tomentosis; stipulis filiformibus deciduis 2–4 mm. longis; inflorescentia terminali paniculata ascendenter pauciramosa supra folia valde projecta ca.

15 cm. longa 5 cm. crassa; floribus in cymas plurifloras distantes aggregatis; pedicellis 3–7 mm. longis pubescentibus; sepalis ca. 7 mm. longis late oblanceolato-linearibus ca. 1.5 mm. latis extus stellato-tomentulosis intus glabris 5–7-nervis supra basin reflexis, cornu 0.3–0.5 mm. longo; petalis obovatis 5–6 mm. longis apice rotundatis basi late unguiculatis; staminibus 25–35; disco et ovario villosis; fructibus ignotis.—ANGOLA: east of Cuanza River, Sept. 20, 1923, *Anita G. Curtis 231* (TYPE, Gray Herb.).—Obviously related to *T. Welwitschii* Masters from which it is distinguishable by its lack of pubescence, inconspicuous stipules, and smaller leaves and flowers.

Ochna angolensis, sp. nov., fruticula 1–5 dm. alta glaberrima e radice crassa lignosa oriens; caulibus pluribus 1–2 mm. crassis subsimplicibus erectis; foliis subcoriaceis oblongo-oblanceolatis vel oblanceolatis integerrimis vel apicem versus parcissime obsoleteque serrulatis 5–8 cm. longis 12–24 mm. latis 2–4 mm. longe petiolatis apice obtusis mucronatis basi cuneatis, nervis lateralibus majoribus 18–24 angulo acuto in costa insidentibus, venis numerosis in costa subrectangulariter impositis atque a nervis transversis reticulatis, nervis venisque supra prominulentibus; stipulis deciduis lineari-lanceolatis 3–5 mm. longis; floribus flavis in pseudoracemos 4–7-floros laxos 2–6 cm. longos 2.5–5 cm. crassos 2–5 mm. longe pedunculatos axillares dispositis; racemis conjunctim inflorescentiam complexam laxiusculam multifloram 2.5–4.5 cm. crassam formantibus; pedicellis 5–8 mm. longis; pedunculis unifloris 3–5 mm. longis; bracteis inconspicuis deciduis subulatis 1–3 mm. longis; sepalis obovatis apice rotundatis petalis aurantiaco-flavis oblonge obovatis 9–14 mm. longis; staminibus 25–35 quam petala brevioribus; filamentis filiformibus 3–4 mm. longis quam antherae 2–3-plo longioribus; antheris linearioblongis longitudinaliter dehiscentibus; ovario 5-lobo glabro.—ANGOLA: Dondé, Bailundo, ca. 1500 m. alt., Sept. 8, 1923, *Anita G. Curtis 158* (TYPE, Gray Herb.), *136;* dry, hard soil at Cuanza River, Sept. 13, 1923, *Anita G. Curtis 171;* west bank of Cuanza River, Sept. 25, 1923, *Anita G. Curtis 372.*—Related to *O. Debeerstii* De Wild., which also occurs in Angola, but differing in its broader, larger, obtuse, subentire leaves and larger, more floriferous racemes of distinctly larger flowers. Oil obtained from the leaves of the plant is said to be used in ointments.

Symphostemon articulatus, sp. nov., glaberrimus herbaceus verisimiliter annuus; caule erecto gracili laxe et ascendenter alterni-ramoso subtereti ca. 35 mm. alto infra medium sparse alternifolia; ramis ramulisque a bracteis lanceolatis caducis 2–3 mm. longis suffultis; foliis non visis ut videtur caducis saltim ab exemplis Dominae

Curtisiae deficientibus; inflorescentia racemosa terminali laxa 10–15 cm. longa 2–3 cm. crassa; pedicellis laxe ascendentibus 8–10 mm. longis a bracteis minutis deciduis suffultis medium versus articulatis, parte superiori fusce et sparse stellato-setulosa decidua, parte inferiori persistenti glabrata; calyce campanulato extus glandulifero fructifero 6–7 mm. longo ca. 3.5 mm. crasso; lobo superiori late ovato breviori; lobis inferioribus anguste triangularibus acutis; corolla alba vel dilute rosea calyce 4–5-plo longiori glabra extus glandulifera, tubo cylindrico supra basem abaxillariter valde gibboso ca. 4 mm. longo 1.5–2 mm. crasso, faucibus late campanulatis ca. 4–5 mm. longis 3–4 mm. crassis, labio inferiori ca. 10 mm. longo ovato ca. 8 mm. lato obtuso, lobis labii superioris 4, exterioribus suborbicularibus 2 mm. longis, interioribus oblongo-ovatis ca. 1.1 mm. longis inconspicuis ab exterioribus imbricatis obscuratis; filamentis linearibus ca. 8 mm. longis basem versus ca. 1.5 mm. longe connatis; nuculis globosis ca. 1.8 mm. crassis rubescentibus subopacis sublaevibus.—ANGOLA: east of the Cuanza River, Sept. 23, 1923, *Anita G. Curtis 309* (TYPE, Gray Herb.).—Differing from *S. insolitus* (Wright) Hieron. in its larger and differently proportioned, decidedly sigmoid, pale corollas which have a well developed proper tube and proportionately smaller upper lip. In *S. articulatus* the outer pair of lobes on the upper lip are much the largest, being roughly orbicular in outline and surpassing the oblong-ovate inner lobes, as well as strongly overlapping and somewhat hiding them. The peduncles of the reduced racemose panicles bear only a single flower apiece, and hence the pedicel appears about twice its real length and is apparently articulate near its middle. Upon maturing the pedicel and calyx fall away leaving the rhachis of the inflorescence beset with the persistent peduncles. FIG. 7.

Ocimum cuanzae, sp. nov., perenne herbaceum 2.5–4 dm. altum; caulibus pluribus pauce stricteque ramosis tetragonis sulcatis albide septateque hispido-villosis; foliis firmis lanceolatis vel oblongo-lanceolatis 4–11 cm. longis 1.5–3.5 cm. latis glaberrimis vel sparsissime villosis minute impresso-glandulosis apice rotundato-obtusis basi abrupte attenuatis subtus pallidis flavescenti-glaucis conspicue nervatis margine grossidentatis ciliatis; petiolis 10–13 mm. longis sparse villosis; racemis multifloris 3–8 cm. longis 10–15 mm. crassis 1–3.5 cm. longe pedunculatis terminalibus vel axillaribus, verticellastris 4–5-floris; pedicellis 1–4 mm. longis dense villosis; calyce villoso purpurascenti nutanti, tubo campanulato fructifero 5–6 mm. longo, dente superiori ovato-orbiculari acuminato decurrenti, dentibus lateralibus triangulari-ovatis longissime acuminatis, dentibus inferioribus subulatis elongatis; corolla 10–12 mm. longa extus pubes-

centi, tubo calycem floriferum aequanti 5–6 mm. longo, labiis tubo brevioribus extus pallide glanduliferis pubescentibus, inferiori oblongo-lanceolato ca. 5 mm. longo apice bilobato, lobulis ca. 1 mm. longis oblongo-ovatis, labio superiori subrectangulari 2.5 mm. longo et lato apice ca. 1 mm. profunde trilobatis, lobulis ovatis; staminibus 4 inclusis, filamentis exappendiculatis glabris 2 mm. longis linearibus. —ANGOLA: near the Cuanza River, Sept. 24, 1923, *Anita G. Curtis 342* (TYPE, Gray Herb.), *343*.—Belonging to the § *Gymnocimum* and apparently most nearly related to *O. laxiflorum* Baker, from which, to judge from descriptions, it differs in its larger, more elongate, firm, dentate leaves, and less open inflorescence. FIG. 6.

Among the ferns collected by Mrs. Curtis and determined at the Gray Herbarium by Mr. C. A. Weatherby one appears to require a new combination of names to designate it in accordance with the International Rules of Botanical Nomenclature. At Mr. Weatherby's request this nomenclatorial change with explanatory synonymy may be here placed on record as follows:

THELYPTERIS PALUSTRIS Schott, var. **squamigera** (Schlecht.) Weatherby, n. comb. *Aspidium Thelypteris β. squamigerum* Schlecht. Adumb. 23, pl. 11 (1825). *A. squamulosum* Kaulf. ex Schlecht. l. c. (in synonymy). *Lastrea squamulosa* Presl, Tent. 76 (1836). *Nephrodium squamulosum* Hook. f. Fl. New Zealand, ii. 39 (1855). *A. Thelypteris β. squamuligerum* Mett. Abh. Senckenb. Naturf. Ges. ii. 112 (1858). *N. Thelypteris β. squamulosum* Hook. Sp. Fil. iv. 88 (1862). *N. Thelypteris*, var. *β. squamuligerum* Sim, Ferns S. Africa, 180 (1892). *Dryopteris Thelypteris*, var. *β. squamuligerum* [sic] Sim, Ferns South Africa, ed. 2, 102 (1915).

EXPLANATION OF PLATES.

PLATE 1. Fig. 1. *Aeschynomene Curtisiae* Johnston, n. sp. × ½; 1a. lower surface of leaf of same × 1. Fig. 2. *Crotalaria bicolor* Johnston, n. sp. × ½; 2a. mature legume of same × 2. Fig. 3. *Cryptosepalum Curtisiorum* Johnston, n. sp. × ½; 3a. petal × 1, 3b. submature pod × ½, 3c. flower after removal of bracteoles, petal, and 2 stamens × 2. Fig. 4. *Brachystegia Russelliae* Johnston, n. sp. × ½; 4a. flower after removal of bracteoles × 2; 4b. bracteole × 1½; 4c. leaf × 1.

PLATE 2. Fig. 5. *Polygala congestiflora* Johnston, n. sp. × ½; 4a. wing × 1. Fig. 6. *Ocimum cuanzae* Johnston, n. sp. × ½; 6a. a large leaf × ½; 6b. fruiting calyx × 1. Fig. 7. *Symphostemon articulatus* Johnston, n. sp. × ½; 7a. side view of flower × 1. Fig. 8. *Dolichos linearifolius* Johnston, n. sp., in very immature foliage × ½.

A. Brackett del.

1. AESCHYNOMENE CURTISIAE Johnston, spec. nov.
2. CROTALARIA BICOLOR Johnston. spec. nov.
3. CRYPTOSEPALUM CURTISIORUM Johnston, spec. nov.
4. BRACHYSTEGIA RUSSELLIAE Johnston, spec. nov.

A. Brackett del.

5. POLYGALA CONGESTIFLORA Johnston, spec. nov.
6. OCIMUM CUANZAE Johnston, spec. nov.
7. SYMPHOSTEMON ARTICULATUS Johnston, spec. nov.
8. DOLICHOS LINEARIFOLIUS Johnston, spec. nov.

III. ON SOME SOUTH AMERICAN PROTEACEAE.

By I. M. Johnston.

Euplassa occidentalis, sp. nov., arborea; ramis juventatis ferrugineo-tomentulosis solidis alternis lignosis; foliis abrupte pinnatis alternis 30–35 cm. longis 13–15 cm. latis patenti-erectis 4-jugis; petiolis cum rhachibus 20–23 cm. longis minute ferrugineo-velutinis striatis; foliolis oppositis vel alternis breviter petiolulatis obovatis vel obovato-oblongis 6–15 cm. longis 35–70 mm. latis obtusis integerrimis glabratis venosis bicoloribus supra nitidis subtus opacis, superioribus oppositis majoribus; stipulis nullis; racemis 15–20 cm. longis 3–3.5 cm. crassis quam foliae brevioribus dense strigosis in axillis superioribus solitariis; floribus albis geminatis patenter 4–5 mm. longe pedunculatis 1–3 mm. longe pedicellatis; alabastris rectis cylindricis 10–12 mm. longis basem versus dilatatis apicem versus axillariter gibbosis strigoso-canescentibus; sepalis 4 inaequalibus lineari-spathulatis intus glabris apicem versus abrupte acute subcucullate ovato-dilatatis; antheris subsessilibus ovato-oblongis acutis bilocularibus albis; ovario glabro vel sparsissime villoso; stylo glabro apicem versus compresso-dilatato; stigmate laterali rubescenti oblongo; glandulis 4 carnosis depresso-orbicularibus glabris; fructibus ignotis.—Ecuador: gold mine near Zaruma, between Portovelo and El Tambo, Prov. Oro, alt. 600–1000 m., Sept. 2, 1923, *Hitchcock, 21,311* (type, Gray Herb.).—Apparently most nearly related to *E. inaequalis* (Pohl) Engler, of eastern Brazil, from which it is readily distinguished by its well developed peduncles, straight style, longer and more distinctly lateral pubescent stigma, less pubescent longer sepals, and 4-jugate leaflets. It is the first species to be reported from west of the Andes and the only one outside of Brazil and Guiana.

Euplassa bahiensis (Meisn.), comb. nov. *Adenostephanus bahiensis* Meisn. in Mart. Fl. Brasil. v. pt. 1, 94 (1855).

Euplassa incana (Klotzsch), comb. nov. *Adenostephanus incana* Klotzsch, Linnaea xv. 52 (1841).

Euplassa laxiflora (Meisn.), comb. nov. *Adenostephanus laxiflora* Meisn. in Mart. Fl. Brasil. v. pt. 1, 94 (1855).

Euplassa legalis (Vell.), comb. nov. *Dicneckeria legalis* Vell. Fl. Flum. 41 (1825); Icones i. 105 (1827). *Adenostephanus Sellowii* Klotzsch, Linnaea xv. 52 (1841).

Euplassa nitida (Meisn.), comb. nov. *Adenostephanus nitida* Meisn. in Mart. Fl. Brasil. v. pt. 1, 94 (1855).

Euplassa organensis (Gard.), comb. nov. *Rhopala organensis* Gard. in Hook. London Jour. Bot. iv. 135 (1845).

Euplassa pinnata (Lam.), comb. nov. *Roupala pinnata* Lam. Encyc., Tab. i. 243 (1791). *E. meridionalis* Salisb. in Knight, Prot. 101 (1809). *Adenostephanus guyanensis* Meisn. in Mart. Fl. Brasil. v. pt. 1, 95 (1855).

Roupala monosperma (R. & P.), comb. nov. *Embothrium monospermum* R. & P. Fl. Peruv. i. 63, t. 98 (1798). *R. peruviana* R. Br. Trans. Linn. Soc. ser. 1, x. 192 (1811).

IV. STUDIES IN THE BORAGINACEAE.—III.

By Ivan M. Johnston.

1. The Old World Genera of the Boraginoideae.

With the object of furnishing substantial foundation for phylogenetic speculations concerning the American eritrichioid borages, a study was recently undertaken of the Asiatic genera of the tribe *Eritrichieae*. This raised so many doubts concerning the naturalness of the currently accepted classification of the tribe, that it was finally found advisable to review all the Old World genera of the subfamily *Boraginoideae* in order that certain peculiar genera might be satisfactorily placed tribally. The results of this study of generic and tribal lines, consisting of new generic keys, generic bibliography, and various systematic and taxonomic notes, are presented in this paper. The work was done wholly in the library and upon the rich boraginaceous collections of the Gray Herbarium. Through the courtesy of Dr. W. R. Maxon, however, I have had the privilege of studying certain very helpful material contained in the United States National Herbarium.

The system of tribal classification suggested in this paper finds its justification in the observation, that from the *Lithospermeae*, through the *Eritrichieae*, to the *Cynoglosseae* there is a group of roughly concomitant morphological trends. The most evident of these is for the nutlets to shift from a basal or abradicular attachment, through a lateral one, to an attachment that is apical or adradicular; for the nutlets to change from usually smooth and rounded towards commonly margined and roughened or appendaged; and for the lobed or divided style and two stigmas to tend towards a simple style and solitary stigma. It is also a notable fact that corolla-structures, variable in the *Lithospermeae*, tend to become rather uniform in the *Cynoglosseae*, whereas the nutlets act in directly the opposite manner. The tribe *Anchuseae* is a natural group, appearing to represent an off-shoot from the *Lithospermeae*, and does not seem to belong to the phylogenetic line terminating in the *Cynoglosseae*.

In the past the tribes have been defined entirely upon the basis of nutlet-attachment. Though this has thrown the genera into more or less homogeneous tribes, it has tended to separate from the groups to which they naturally belong such genera as *Bothriospermum*, *Trigonotis*, *Myosotis*, etc., which are aberrant in nutlet-structures, and has made it difficult for those not thoroughly acquainted with the plants to place tribally such genera as *Mertensia*, *Plagiobothrys*, *Antiphytum*, etc., which are more or less ambiguous in the crucial nutlet-characters. In placing the genera in the present system I have tried to balance the number and nature of the structural agreements with those of disagreement, and after grouping the genera in the manner which seems most natural have then tried to discover the character or characters which distinguish or commonly indicate the tribal groups formed. No single character was discovered which would invariably indicate the tribes, since, as is usually the case in such a variable natural group, the component elements, while agreeing in many details, all show the common tendency of departing individually and unexpectedly in one character or another from the condition perhaps otherwise uniform and diagnostic of the group. The chief fault with the current classification results from the lack of recognition of this well known fact. Nutlet-attachment, while diagnostic in the main, appears susceptible to the same aberrancies as the other characters, and it therefore seems advisable to attempt the use of several characters, rather than one, in determining the natural tribal positions of the genera treated. The tribes of the *Boraginoideae* and the Old World genera may be distinguished as follows:—

Lithospermeae.

Nutlets erect, straight (or bent in *Alkanna*), smooth or verrucose, unmargined; areola basal or occasionally suprabasal, near tip of cotyledon, unmargined, flat or nearly so, not at all strophiolate; gynobase flat or low-pyramidal, not excavated; style cleft or entire; stigmas 2 (or 4 in *Arnebia* sp.), distinct or proximate or rarely fused, capitate or obscurely thickened; corolla yellow or orange or occasionally white or somewhat purplish.—As here defined the tribe is in its broadest sense and includes those genera with more or less irregular corollas which have been grouped to form the tribe *Echieae*. The development of zygomorphy furnishes no substantial basis for the recognition of a fifth tribe, for between the conspicuously irregular corollas of certain Echiums, and the regular corollas of typical Lithospermums, there is every intermediate stage of irregularity. *Echium italicum*

has regular or subregular corollas, and in a number of the Echiums of the section *Lobostemon* the corolla is also regular or practically so. Even in the restricted *Lithospermeae* there is a tendency towards zygomorphy. It is slightly developed in *Macromeria*, and more so in *Megacaryon* and *Echiochilon*. On account of its noticeable development in the last two genera, and despite their certain relations with the restricted *Lithospermeae*, they have been forced into the *Echieae*. Zygomorphy is sporadic in the *Boraginoideae*, and there seems no good reason why its several occurrences in the *Lithospermeae* should characterize a special tribe when the corolla-irregularities of *Lycopsis* in the *Anchuseae*, and *Caccinia* in the *Cynoglosseae* go unrecognized. As the vegetative and fruiting structures of the *Lithospermeae* and the *Echieae* are quite similar, it seems best, especially since zygomorphy in the *Echieae* is probably polyphyletic, to combine the two tribes as is done in this paper. With the disappearance of the *Echieae* the four remaining tribes of the subfamily, like the subfamilies themselves, are all definable without reference to corolla-structures and entirely upon the characters of the pistil, particularly the attachment of the nutlets, the shape of the gynobase, and the number and relations of the stigmas. The endemic American genera referable to the *Lithospermeae* are *Macromeria, Lasiarrhenum, Onosmodium, Antiphytum, Moritzia*, and *Thaumatocaryon*. Concerning the correct tribal position of the last three genera there is still some doubt.

Key to Genera of Lithospermeae.

Stamens deeply sagittate, auricles frequently tailed; corolla somewhat cylindrical or globose with very short broad lobes.
  Nutlets confluent to form two 2-celled nutlets; leaves amplexicaul; plant glabrate, green ..... 1. *Cerinthe.*
  Nutlets all distinct and single-celled; leaves narrowed to their attachment, never amplexicaul; plant conspicuously pubescent, more or less canescent.
    Corolla more or less cylindrical, not inflated towards the base; filaments slender ..... 2. *Onosma.*
    Corolla somewhat globose, with 5 saccate inflations near base; filaments broadened and thickened above attachment ..... 3. *Maharanga.*
Stamens not conspicuously sagittate; corolla only exceptionally cylindrical, lobes well developed.
  Anthers apically with a subulate prolongation, this connivent about the style.
    Filaments dorsally inflated ..... 4. *Cystostemon.*
    Filaments not at all inflated ..... 5. *Vaupelia.*
  Anthers obtuse or merely mucronate at apex.
    Corolla regular or practically so.
      Nutlets strongly bent below the middle, arching over the somewhat convex gynobase, usually somewhat stipitate due to a constriction just above the basal areola ..... 6. *Alkanna.*

Nutlets straight or practically so, substipitate only in *Sericostoma*.
Throat of corolla appendaged or obviously pubescent or both.
Stamens attached at unequal heights in the pubescent corolla-tube.....7. *Aipyanthus*.
Stamens attached at equal heights.
Throat of corolla conspicuously villous and more or less closed by the pubescence.....8. *Sericostoma*.
Throat of corolla not notably villous and not obscured by the pubescence.
Nutlets cornute-acuminate; foliage ample, herbaceous; corolla conspicuously pubescent in the tube, faucal appendages or downy areas not developed.....9. *Ancistrocarya*.
Nutlets rounded or obtusely conical at apex; leaves narrow, firm; corolla with faucal protuberances or pubescent or with glandular areas.....10. *Lithospermum*.
Throat of corolla glabrous or glabrate; corolla appendaged or pubescent inside only at very base if at all.
Style and stamens protruded at least past corolla-sinuses and usually much beyond.....11. *Moltkia*.
Style and stamens not reaching corolla-sinuses.
Corolla longitudinally plicate within below, about half length of very elongate linear calyx-lobes; biennial.....12. *Macrotomia*.
Corolla not plicate, always exceeding calyx; annual or perennial.....13. *Arnebia*.
Corolla manifestly irregular.
Corolla transversely plicate in throat; anthers somewhat sagittate; filaments equal and borne at equal heights in corolla.....14. *Zwackhia*.
Corolla not plicate in throat; anthers oblong or ovate; filaments commonly unequal and borne at unequal heights in the corolla.
Style and stamens short, included, not evident.....15. *Echiochilon*.
Style and filaments usually long, evident, protruded from the corolla or nearly so.
Nutlets smoothish and rounded, very large; rank herbs with fruiting calyx 2-3 cm. long.....16. *Megacaryon*.
Nutlets tuberculate and somewhat angulate; herbs or shrubs with fruiting calyx 13 mm. long or less..17. *Echium*.

1. **Cerinthe** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

A very natural genus of 4 or 5 species, occurring in the Mediterranean Region and in Central Europe. The 2-celled nutlets characteristic of this genus are evidently the result of the confluence of 2 distinct nutlets, since in some species the line of fusion and the distinct apices of the conjoined nutlets are readily discernible. Although recently treated by me, Contr. Gray Herb. n. s. lxx. 5 (1924), as of the *Eritrichieae*, the genus is indubitably an immediate relative of *Onosma* and hence belongs to the *Lithospermeae*.

2. **Onosma** L. Sp. Pl. ed. 2, 196 (1762); Gen. Pl. ed. 6, 76 (1764).

Colsmannia Lehm. Mag. Ges. Naturf. Berlin viii. 92, t. 4 (1818); Asperif. ii. 356 (1818). *Podonosma* Boiss. Diag. ser. 1, xi. 113 (1849); Fl. Orient. iv. 178 (1875).—A large natural genus of the Mediterranean Region and western Asia. *Onosma syriacum* agrees with the other species of the genus in its flowers and habit, but differs in having incurved nutlets that are apparently joined laterally to a pyramidal gynobase. The genus *Podonosma* was erected for this species. It may be worthy of recognition.

3. **Maharanga** A. DC. Prodr. x. 71 (1846).

A genus closely related to *Onosma*, but readily separated by its saccate corolla. It occurs in Nepal and Sikkim and contains 2 closely related species, *M. Emondi* (Wall.) A. DC. and *M. Wallichianum* A. DC.

4. **Cystostemon** Balf. f. Proc. Royal Soc. Edinb. xii. 82 (1883); Trans. Royal Soc. Edinb. xxxi. 186, t. 56 (1888).

A remarkable genus containing one species, *C. socotranus* Balf. f., a very distinct endemic of Socotra.

5. **Vaupelia** Brand in Fedde, Repert. xiii. 82 (1914).

A genus of 7 species, ranging from southwest Africa to Arabia. The members of the genus have a remarkable habital similarity to *Trichodesmia*, and most of its species have been transferred from that genus. As pointed out by Brand, however, its relations are clearly with *Cystostemon*, from which it differs only in the form of the filament.

6. **Alkanna** Tausch, Flora vii. 234 (1824).

Baphorhiza Link, Handb. i. 578 (1829). *Campylocaryum* DC. in Meisner, Gen. i. 280; ii. 189 (1840). *Camptocarpus* C. Koch, Linnaea xvii. 304 (1843).—About 25 species in the Mediterranean Region and western Asia. Although commonly referred to the *Anchuseae* the species of this genus have nutlets lacking a broadly rimmed areola and plug-shaped strophiola, and have a habit somewhat different from the other members of that tribe. It seems best referred to the *Lithospermeae*, since, as shown by the direction of the funicle and the bent seed, the nutlets are in fact basally attached. Although attached by the morphological base, the sharp bend at the middle of the nutlet gives an impression of a lateral attachment. The areola,

which is substipitate and slightly oblique, is attached to a convex gynobase.

7. **Aipyanthus** Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 599 (1851).

A single species, *A. echioides* (L.) Stev., growing at high altitudes in western Asia. Commonly referred to *Macrotomia*, but differing in having the corolla-tube pubescent within, and in having the stamens placed at unequal heights on the corolla. It differs also in habit.

8. **Sericostoma** Stocks in Wight, Icones iv. pt. 2, 14, t. 1377 (1850).

Species above 5, all of restricted range, and occurring in western India, Persia, Arabia, and Somaliland, usually at no great distance from the ocean. *Sericostoma pauciflorum* Stocks, *S. strigosa* Defl., and *S. verrucosum* Beck have nutlets with a suprabasal substipitate attachment. I have seen no fruit of *S. Kotschyi* (Boiss.) Benth. or *S. albidum* Franch. The genus departs from the *Lithospermeae* in its nutlets and pyramidal gynobase, but its corolla, style, habit, and range emphasize its relations in that tribe.

9. **Ancistrocarya** Maxim. Bull. Acad. St. Petersb. xvii. 443 (1872).

With a single species, *A. japonica* Maxim., from Japan. Evidently related to *Lithospermum*, but differing in its broad veined foliage, acuminate nutlets, and densely pubescent corolla-tube.

10. **Lithospermum** [Tourn.] L. Sp. Pl. 132 (1753); Gen. Pl. 64 (1754).

Buglossoides Moench, Meth. 418 (1794). *Aegonychon* S. F. Gray, Nat. Arrang. Brit. Pl. ii. 354 (1821). *Rhytispermum* Link, Handb. i. 579 (1829). *Margarospermum* Reichb. in Spach, Hist. Nat. Veg. Phaner. ix. 31 (1840); Decne. in Jacquemont, Voy. Ind., Bot. 122 (1844).—A polymorphous genus of 50 to 60 species, about 10 in South Africa and about the same number in Eurasia, the remainder in America. The American species find their nearest relations in South Africa, and in Japan and adjacent Asia. The shrubby Mediterranean species, usually referred to *Lithospermum*, appear to be generically distinct, and seem best placed in the *Anchuseae*.

11. **Moltkia** Lehm. Neu. Schrift. Naturf. Ges. Halle iii. pt. 2, 3 (1817).

A genus of 8 species, 6 in the Balkans and Near East, one in the Himalayas, and one widely distributed in the deserts of northern Africa and southwestern Asia. The genus is taken here as defined by Wettstein, Oesterr, Bot. Zeitschr. lxvii. 367 (1918). The plant current as *Lithospermum callosum* fits best into *Moltkia,* but in habit and slightly irregular corollas it is aberrant. The lobes of the corolla of *M. callosa* (Vahl) Wetts. are a trifle irregular and two of the lower stamens are usually shorter than the others. It seems best to leave the plant in *Moltkia,* however, since its distinctive characters are not positive.

12. **Macrotomia** DC. in Meisner, Gen. i. 281; ii. 190 (1840).

Leptanthe Klotzsch, Bot. Ergenb. Reise Prinz Waldemar 95, t. 63 (1862).—Containing a single species, *M. Benthami* (Wall.) DC., which occurs in the western Himalayas. From *Arnebia,* its closest relative, *Macrotomia* differs in its characteristic biennial habit, in its short corollas much exceeded by the calyx-lobes, and in the longitudinal plication that marks the lower side of the corolla-tube. As *Macrotomia* has been usually defined it is patently unnatural, since the three species referred to it represented as many genera, and in other than tribal characters agree only in a rank habit of growth. *Macrotomia echioides* is here referred to *Aipyanthus,* and *M. cephalotes* is transferred to *Arnebia.*

13. **Arnebia** Forsk. Fl. Aegypt. 62 (1775).

Dioclea Spreng. Syst. i. 502 and 556 (1825). *Strobila* Don, Gen. Syst. iv. 327 (1837). *Meneghinia* Endl. Gen. 648 (1838). *Stenosolenium* Turcz. Bull. Soc. Nat. Moscou xiii, pt. 2, 253 (1840). *Munbya* Boiss. Diag. ser. 1, xi. 114 (1849). *Toxostigma* A. Rich. Ten. Fl. Abyss. ii. 86, t. 77 (1851).—A large polymorphous genus centering in western Asia. It is well characterized by its herbaceous habit, included stamens and style, and corolla with glabrous tube and unappendaged throat. There seems no good reason why the plants passing as *Macrotomia cephalotes* (DC.) Boiss. and *M. euchroma* (Royle) Hook. f. & Thoms. should not be referred to *Arnebia.* Both differ in habit and floral characters from *Macrotomia Hookeri,* the type of its genus, and both lack structural characters by which they can be distinguished frcm *Arnebia.* The former was originally described as *Arnebia cephalotes* by De Candolle, and is notable only

because of its coarse habit and large flowers. It seems merely a glorified member of its genus. There is even less reason for excluding *M. euchroma* from *Arnebia*, since it differs from the members of that genus only in its coarser habit of growth. Its relations seem so obvious that the following combination appears entirely justified.

Arnebia euchroma (Royle), comb. nov. *Lithospermum euchromon* Royle acc. Benth. in Royle, Illust. i. 305 (1839); DC. Prodr. x. 82 (1846). *Macrotomia euchroma* Hook. f. & Thom. acc. Clarke, Hook. Fl. Brit. India iv. 177 (1883); Paulsen, Bot. Tidssk. xxvii. 216 (1906). For further synonymy see Lipsky, Act. Hort. Petrop. xxvi. 505 (1910).

14. **Zwackhia** Sendtn. in Reichb. Icon. Fl. Germ. xviii. 65, t. 115 (1858).

Halacsya Dörfler, Allgem. Bot. Zeitschr. 1903, pg. 46 (1903).—A single species, *Z. Sendtneri* (Boiss.) Maly., in Jugo-Slavia. Although with an irregular corolla the relations of the plant seem to be with *Lithospermum* or *Moltkia*, cf. Wettstein, Oesterr. Bot. Zeitschr. lxvii. 365 (1918), rather than with *Echium*, the genus with which it has been usually associated.

15. **Echiochilon** Desf. Fl. Atlant. i. 166, t. 47 (1800).

Chilochium Raf. Ann. Gen. Soc. Phys. viii. 269 (1821). *Exioxylon* Raf. Fl. Tellur. iv. 85 (1838). *Leurocline* S. Moore, Jour. Bot. xxxix. 257, t. 424, fig. 1, (1901).—Six species in Africa and southwestern Asia. There seems to be no valid reason for recognizing *Leurocline*. All the species referred to *Leurocline* and to *Echiochilon* have a similar rather odd, bilabiate corolla, and short included stamens that are borne at unequal heights in the hairy throat of the corolla. The bracteate inflorescence and irregular calyx is common to all, in addition to a common general aspect. The range of the enlarged *Echiochilon* is thoroughly natural. The difference in nutlet-attachment that is supposed to distinguish the two genera does not seem to be borne out in fact. *Leurocline* is said to be distinguished from its relative by having its nutlets "fixed by a flat base to a flat (not conical) gynobase." However, in the type species of *Leurocline*, *L. lithospermoides* Moore, the nutlets are not so affixed, but are clearly attached suprabasally to a subulate gynobase. In *Echiochilon fruticosum*, the type species of its genus, the nutlet has a straight and angled inner edge, is strongly constricted dorsally at the base, and bears its very small areola on the slightly oblique tip of the neck-like

basal portion. The areola of *E. fruticosum*, which is more nearly basal than in any species of *Leurocline*, is attached to a subulate gynobase quite like that in *Leurocline*, but much nearer the base than in any species of that genus. When all the species of these two genera are considered and the various nutlet-attachments studied, the hopes of finding generic characters in the form of nutlets or in their attachments are completely blasted. Past writers have relied upon the irregular calyx of *Echiochilon* to distinguish it from *Echium*. This is not only unnecessary, but is impossible, for the calyces of such Echiums as *E. piniana* Webb & Berth. and *E. Decaesnei* Webb are even more irregular than are those of *Echiochilon*. The bibliography of the species referable to *Echiochilon* is as follows:—

ECHIOCHILON FRUTICOSUM Desf. Fl. Atlant. i. 167, t. 47 (1800); Blatter, Record Bot. Surv. Ind. viii. 316 (1921). *Lithospermum divaricatum* Sieb. in Spreng. Syst. i. 543 (1825–28).—Northern Africa and southwestern Asia.

E. LONGIFLORUM Benth. in Hook. Icon. xiii. 60, t. 1277 (1878).—Aden.

E. somalense (Franchet), comb. nov. *Lobostemon somalensis* Franchet, Sert. Somal. 44 (1882). *Leurocline somalensis* S. Moore, Jour. Bot. xxxix. 258 (1901).—Somaliland.

E. cryptocephalum (Baker), comb. nov. *Lobostemon cryptocephalum* Baker, Kew Bull. 1894, pg. 30 (1894).—British Central Africa. Perhaps not of this genus.

E. lithospermoides (S. Moore), comb. nov. *Leurocline lithospermoides* S. Moore, Jour. Bot. xxxix. 257, t. 424, fig. 1 (1901). *Lobostemon lithospermoides* Baker, Fl. Trop. Africa iv. pt. 2, 60 (1905).—British East Africa.

E. Chazaliei (Boissieu), comb. nov. *Lithospermum Chazaliei* Boissieu, Jour. de Bot. x. 220 (1896). *Leurocline Chazaliei* Bonnet, Bull. Soc. Bot. France lviii. 38 (1911); Chevalier, Expl. Bot. Afri. Occ. Franç. i. 452 (1920). *Leurocline mauritanica* Bonnet, Bull. Mus. Hist. Nat. Paris xiv. 403 (1908); Fedde, Repert. ix. 496 (1911).—Mauritania.

16. **Megacaryon** Boiss. Pl. Orient. Nov. i. 7 (1875).

A genus of the Levant which is doubtfully distinct from *Echium*, from which it is weakly separated by its smoothish nutlets and greatly accrescent calyx. A discussion of this monotype is given by Lacaita, Jour. Linn. Soc. xliv. 393 (1919).

17. **Echium** [Tourn.] L. Sp. Pl. 139 (1753); Gen. Pl. 68 (1754).

Lobostemon Lehm. Linnaea v. 378, t. 5 (1830); Buek, Linnaea xi. 129 (1837). *Isorium* Raf. Fl. Tellur. ii. 61 (1836). *Traxara* Raf. Fl. Tellur. iv. 85 (1838). *Isoplesion* Raf. l. c. 86. *Oplexion* Raf. l. c. 86. *Larephes* Raf. l. c. 86. *Argyrexias* Raf. l. c. 86. *Penthysa* Raf. l. c. 86.—The largest and most difficult genus of its tribe. Native in the Mediterranean Region, on the Atlantic Islands, and in South Africa. I have searched in vain for characters which would distinguish generically the South African species from those north of the equator. Most of the South African species have stamens with a tuft of hair at the base of the filament. It was with this character that *Lobostemon* was originally distinguished from the more northern *Echiums*, and upon which it has been chiefly maintained subsequently. It is strange, therefore, to find that a goodly number of species of *Lobostemon*, such as *L. alopecuroideus*, *L. eriostachyus*, *L. latifolius*, *L. sanguineus*, *L. splendens*, etc., have stamens which not only in pubescence and attachment, but in size and appearance are quite indistinguishable from those of indubitable Echiums. These species, in fact, were at one time referred to *Echium* by De Candolle, Prodr. x. 13 (1846). Some authors, realizing the utter failure of staminal structures as generically diagnostic characters, have sought to maintain *Lobostemon* by finding diagnostic characters in the shape of the stigma. The stigma in the South African species, though usually given as entire or subcapitate, in fact varies from entire and solitary to divided with the stigmas geminate. *Echium* usually has lobed styles, but *E. rubrum*, as pointed out by Lacaita, Jour. Linn. Soc. xliv. 365 (1919), has the stigma merely emarginate or divided in a manner quite indistinguishable from that of *Lobostemon*. *Echium* and *Lobostemon* are not to be distinguished habitally, and if such authors as Wright, Fl. Cap. iv. pt. 2, 44 (1904), are followed in the generic disposition of *Echium formosum*, then there is no distributional difference between the two genera. Since its claims to generic rank are no more strong than are those of the giant Echiums of the Atlantic Islands, I see no reasons why *Lobostemon* should not be merged with *Echium*. The following new combinations are required:—

Echium acutissimum (Buek), comb. nov. *Lobostemon acutissimus* Buek, Linnaea xi. 139 (1837).

E. Buekii, nom. nov. *L. elongatus* Buek, l. c. 140. Not *Echium elongatum* Lam. (1791).

E. capitiforme (DC.), comb. nov. *L. capitiformis* DC., Prodr. x. 12 (1846).

E. cephaloideum (DC.), comb. nov. *L. cephaloideus* DC., l. c. 12.
E. cinereum (DC.), comb. nov. *L. cinereus* DC., l. c. 10.
E. curvifolium (Buek), comb. nov. *L. curvifolius* Buek, l. c. 137.
E. diversifolium (Buek), comb. nov. *L. diversifolius* Buek, l. c. 140.
E. echioides (Lehm.), comb. nov. *L. echioides* Lehm., Linnaea v. 378, t. 5 (1830).
E. fastigiatum (Buek), comb. nov. *L. fastigiatus* Buek, l. c. 141.
E. Galpinii (Wright), comb. nov. *L. Galpinii* Wright, Fl. Cap. iv. pt. 2, 41 (1904).
E. microphyllum (Buek), comb. nov. *L. microphyllus* Buek, l. c. 142.
E. nitidum (Bolus), comb. nov. *L. nitidus* Bolus in Wright, l. c. 38.
E. obovatum (DC.), comb. nov. *L. obovatus* DC., l. c. 10.
E. obtusifolium (DC.), comb. nov. *L. obtusifolius* DC., l. c. 7.
E. oederiaefolium (DC.), comb. nov. *L. oederiaefolius* DC., l. c. 7.
E. paniculaeforme (DC.), comb. nov. *L. paniculaeformis* DC., l. c. 8.
E. pilicaule (Wright), comb. nov. *L. pilicaulis* Wright, l. c. 30.
E. pubiflorum (Wright), comb. nov. *L. pubiflorus* Wright, l. c. 39.
E. sanguineum (Schlechter), comb. nov. *L. sanguineus* Schlechter, Engler's Bot. Jahrb. xxiv. 450 (1897).
E. Schlechteri, nom. nov. *L. collinus* Schlechter in Wright, l. c. 28. Not *E. collinum* Salisb. (1796).
E. stachydeum (DC.), comb. nov. *L. stachydeus* DC., l. c. 7.
E. virgatum (Buek), comb. nov. *L. virgatus* Buek, l. c. 142.
E. Wurmbii (DC.), comb. nov. *L. Wurmbii* DC., l. c., 11.

Anchuseae.

Nutlets erect or oblique or horizontal, straight or curved, smooth or rugose, unmargined; areola basal or lateral, along side or near tip of cotyledons, surrounded by a tumid annular rim, more or less plug-like or rarely merely high-convex, strophiolate; gynobase usually convex, commonly with broad cavities left by the strophiolate plugs; style lobed or entire; stigmas 1 or 2, distinct or completely fused, capitate; corolla blue or rarely white or yellow.—The tribe is confined to the Old World.

Key to Genera of Anchuseae.

Throat of corolla bearing well developed appendages formed by the intrusion of tissue.
  Filaments with a broad dorsal appendage.....18. *Borago.*
  Filaments unappendaged dorsally.
    Stamens conspicuously exserted from the corolla; corolla-lobes linear, revolute.....19. *Trachystemon.*

Stamens included or barely exserted; corolla-lobes broad, never revolute.
Corolla broadly tubular; throat conspicuously developed, campanulate or weakly dilated; lobes short, erect or apically recurved; faucal appendages linear or lanceolate, acute, margin dentate.....20. *Symphytum.*
Corolla funnel-form or more or less long-salverform; throat undeveloped or ill-defined or abruptly expanded; lobes usually elongate, spreading or divergent; faucal appendages deltoid or oblong, obtusish, usually hairy.
Corolla-lobes convolute in the bud.....21. *Trigonocaryum.*
Corolla-lobes imbricate in the bud.
Corolla evidently irregular, limb oblique, tube usually bent.....22. *Lycopsis.*
Corolla regular, limb not oblique, tube straight.
Nutlet-attachment small, borne on a bent supra-basal stipitate prolongation of the nutlet; flowers in long-peduncled leaf-subtended glomerules; leaves broad, netted-veined...23. *Caryolopha.*
Nutlets with a broad sessile basal or lateral attachment; flowers racemose or in axillary glomerules.
Inflorescence naked; leaves herbaceous, broad, obviously netted-veined.....24. *Brunnera.*
Inflorescence bracteate throughout; leaves firm, elongate, vernation absent or obscure.....25. *Anchusa.*
Throat of corolla unappendaged or practically so, commonly glabrous or villous in spots.
Corolla glabrous within; calyx-tube indurated and thickened in fruit; plant fruticose.....26. *Lithodora.*
Corolla more or less pubescent within; calyx herbaceous; herbs.
Stamens borne at summit of corolla-throat and evidently protruded from it.....27. *Elizaldia.*
Stamens borne on corolla-tube, not at all protruded.
Plants mainly annual; nutlets usually rugose.....28. *Nonea.*
Plants perennial; nutlets smooth.....29. *Pulmonaria.*

18. **Borago** [Tourn.] L. Sp. Pl. 137 (1753); Gen. Pl. 67 (1754).

Buglossites Moris, Enum. Sem. Hort. Taur. (1845); Ann. Nat. Sci. ser. 3, v. 365 (1846).—A natural genus with 3 very distinct species, all in the Mediterranean Region. Hance, Jour. Bot. xvii. 301 (1879), has an interesting discussion of the etymology of the word, "borage."

19. **Trachystemon** Don, Edinb. New Philos. Jour. xiii. 239 (1832).

Nordmannia Ledeb. in Nordmann, Bull. Acad. St. Petersb. ii. 312 (1837). *Psilostemon* DC. Prodr. x. 35 (1846).—A natural genus with 2 well marked species in the Mediterranean Region.

20. **Symphytum** [Tourn.] L. Sp. Pl. 136 (1753); Gen. Pl. 66 (1754).

Twenty-five species in Europe and adjacent Asia. The genus was recently monographed by Bucknell, Jour. Linn. Soc. xli. 493 (1913).

21. **Trigonocaryum** Trautv. Act. Hort. Petrop. iii. pt. 2, 278 (1875).

With a single Caucasian species. I know the plant only from descriptions.

Trigonocaryum involucratum (Stev.), comb. nov. *Myosotis involucrata* Stev. Mém. Soc. Nat. Moscou iii. 253 (1812); Bull. Soc. Nat. Moscou xxiv. pt. 1, 602 (1851); Boiss. Fl. Orient. iv. 242 (1875). *T. prostratum* Trautv. Act. Hort. Petrop. iii. pt. 2, 278 (1875); l. c. iv. pt. 2, 395 (1876).

22. **Lycopsis** L. Sp. Pl. 138 (1753); Gen. Pl. 68 (1754).

Buglossa S. F. Gray, Nat. Arrang. Brit. Pl. ii. 351 (1821).—Three species in the Mediterranean Region and Near East. A very close relative of *Anchusa*, from which it differs only in its more or less irregular corollas. Some of the undoubted Anchusas show a slight tendency towards zygomorphy, though never in such an extreme manner as characteristic of *Lycopsis*. Many authors have treated *Lycopsis* merely as a section of *Anchusa*, a treatment with which I am not unsympathetic.

23. **Caryolopha** Fisch. & Trautv. Ind. Sem. Hort. Petrop. iii. 31 (1837).

With a single species, *C. sempervirens* (L.) Fisch. & Trautv., in the northwestern Mediterranean Basin. In recent works usually referred to the closely related genus *Anchusa*. *Caryolopha*, however, appears to merit recognition because of its peculiar nutlets, leafy and ranker habit, and different inflorescence.

24. **Brunnera** Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 582 (1851).

A neglected genus, with 3 species in western Siberia and the eastern Mediterranean Region. The species have been usually referred to *Anchusa*, but their quite different habit and naked racemes seem to justify their recognition as generically distinct.

Brunnera macrophylla (Marschall), comb. nov. *Myosotis macrophylla* Marschall, Fl. Taur.-Cauc. i. 119 (1808); Ledeb. Fl. Ross. iii.

121 (1847–49). *Anchusa myosotidiflora* Lehm. Asperif. i. 234 (1818); Boiss. Fl. Orient. iv. 157 (1875). *B. myosotidiflora* Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 582 (1851).

B. SIBIRICA Stev. Bull. Soc. Nat. Moscou. xxiv. pt. 1, 582 (1851). *Anchusa myosotidiflora*, var. *grandiflora* DC. Prodr. x. 50 (1846).

B. orientalis (Schenk), comb. nov. *Myosotis orientalis* Schenk, Pl. Sp. Itin. Aegypt. 26 (1840). *Anchusa neglecta* A. DC. Prodr. x. 49 (1846).

25. **Anchusa** L. Sp. Pl. 133 (1753); Gen. Pl. 64 (1754).

Buglossum Gaertn. Fruct. i. 322 (1788). (?) *Stomotechium* Lehm. Asperif. ii. 395 (1818). *Pentaglottis* Tausch, Flora xii. 643 (1829). *Gastrocotyle* Bunge, Mem. Acad. Sav. Etr. St. Petersb. vii. 405 (1847). —A variable genus of 30–40 species centering in the Mediterranean Region, but extending through Europe and western Asia, and occurring also in South Africa. Why authors have deemed it advisable to segregate *A. hispida* Forsk. as forming the monotypic genus *Gastrocotyle* is very puzzling, but their reasons for removing it from the *Anchuseae* and placing it in the *Eritrichieae* are utterly incomprehensible. As indicated by Boissier, Fl. Orient. iv. 151 (1875), *A. hispida* is an obvious relative of the annuals, *A. aggregata* Lehm., and *A. Aucheri* A. DC., and is clearly congeneric with these two species, the generic determination of which has never been questioned.

The following species seems to have never been properly named:—

Anchusa humilis (Desf.), comb. nov. *Echium humile* Desf. Fl. Atlant. i. 165 (1800). *A. aggregata* Lehm. Asperif. i. 219 (1818); Icon. 27, t. 47 (1821); Boiss. Fl. Orient. iv. 157 (1875).

26. **Lithodora** Griseb. Spicil. Fl. Rumel. ii. 85 (1844).

Gymnoleima Decne. in Jacquemont, Voy. Ind., Bot. 122 (1844).—A genus of 7 local species, centering in the western Mediterranean Basin. These plants have been commonly referred to *Lithospermum*, but they differ from that genus in their shrubby habit, indurated fruiting calyx-tube, corollas which inside are destitute of either appendages or pubescence, cf. Spengler, Oesterr. Bot. Zeitschr. lxviii. 115, t. 1, fig. 17–22 (1919), and plug-shaped somewhat margined attachment of the nutlets. The group is certainly not referable to *Lithospermum* if the current standard of generic characters is maintained. *Lithodora* has many characters in common with *Moltkia*, and perhaps it should be associated with that genus in the *Lithospermeae*, rather than classed under the *Anchuseae*. The shape and

attachment of the nutlets, as well as its unappendaged corollas, are similar to those found in *Pulmonaria* and *Nonea*, particularly in the former genus. In the attachment of its nutlets *Lithodora* is clearly characteristic of the *Anchuseae*. Besides *Lithodora fruticosa* (L.) Griseb., *L. hispidula* (Sibth. & Sm.) Griseb , and *L. oleifolia* (Lapeyr.) Griseb. there are the following species which have not been properly named.

Lithodora consobrina (Pomel), comb. nov. *Lithospermum consobrinum* Pomel, Nouv. Mat. Fl. Atl. 296 (1874)

L. diffusa (Lag.), comb. nov. *Lithospermum diffusum* Lag. Varied. Cienc. iv. pt. 4, 39 (1805); Gen. Sp. Pl. 10 (1815); Rouy & Fouc. Fl. Fr. x. 314 (1908). *Lithospermum prostratum* Lois. Fl. Gall. ed. 1, 105 (1806). *Lithodora prostrata* Griseb. Spicil. Fl. Rumel. ii. 531 (1844).

L. rosmarinifolia (Ten.), comb. nov. *Lithospermum rosmarinifolium* Ten. Prodr., Suppl. ii. 66 (1811–13); Fl. Nap. i. t. 114 (1811–15).

L. Zahnii (Heldr.), comb. nov. *Lithospermum Zahnii* Heldr. in Halacsy, Verh. Zool.-Bot. Ges. Wien xlix. 190 (1899); Consp. Fl. Graecae. ii. 347 (1902). *Lithospermum fruticosum* of Sibth. & Sm. Fl. Graeca ii. 52, t. 161 (1813).

27. **Elizaldia** Willk. Strand- u. Steppengeb. Iber. Halbins. 128 (1852).

The 3 species of this western Mediterranean genus have been usually referred to *Nonea*, but in having a slightly different habit, and stamens placed high in the corolla-throat and exserted, they seem generically distinct. The generic name, *Phaneranthera*, is a synonym of *Elizaldia*, but appears to have never been legitimately established. The founding of the genus is usually attributed to Meisner, Gen. ii. 189 (1840), but he does not even mention the name. The following combinations are necessary.

Elizaldia violacea (Desf.), comb. nov. *Echioides violacea* Desf. Fl. Atlant. i. 164 (1800). *Nonnea violacea* DC. Fl. Fr. iii. 626 (1805). *N. multicolor* G. Kunze, Flora xxix. 691 (1846). *E. nonneoides* Willk. Strand- u. Steppengeb. Iber. Halbins. 129, cum tab. (1852).

E. phaneranthera (Viv.), comb. nov. *Nonnea phaneranthera* Viv. Fl. Lib. Specim. 9, t. 1, fig. 3 (1824); Murb. Lunds Univ. Årsskr. xxxiv. Afd. 2, no. 7, 10, t. 7, fig. 10–12 (1898).

E. heterostemon (Murb.), comb. nov. *Nonnea heterostemon* Murb. Lunds Univ. Årsskr. xxxiv. Afd. 2, no. 7, 7, t. 7, fig. 13–15 (1898).

28. **Nonea** Medik. Phil. Bot. i. 31 (1789).

Oskampia Moench, Meth. 420 (1794). *Echioides* Desf. Fl. Atlant. i. 163 (1800). *Onochilis* Mart. Denkschr. Acad. Muenchen v. 177 (1817). *Nephrocarya* Candargy, Bull. Soc. Bot. France xliv. 150 (1897).—About 25 species, these chiefly in the Mediterranean Region. Although maintained here, I am of the opinion that *Nonea* should be treated as a section of *Pulmonaria*, for there is no character by which it can be decisively separated from that genus. *Nonea* and *Pulmonaria* have the same corolla and calyx. Though the nutlets of *Nonea* are usually rugose, smooth and shiny ones, similar to those in *Pulmonaria*, occur in *N. obtusifolia* (Willd.) DC. *Nonea* usually has a loosely racemose inflorescence, whereas *Pulmonaria* commonly has a loosely glomerate one, but when the inflorescence of the latter occasionally loosens it reveals an arrangement of flowers quite like that in *Nonea*. The most striking difference between the two genera seems to reside in the root. *Pulmonaria* is always perennial, the stems, in scaly-based tufts, terminating rather fleshy shallow rhizomes. *Nonea* is mostly annual, but in such species as *N. pulla* and *N. alpestris* the subterranean development is apparently a long deep perennial tap-root. It seems probable that *Nonea* and *Pulmonaria* have common immediate ancestors, and that the former is a xerophytic adaptation to rather arid open situations, whereas the latter is a mesophytic adaptation to scopuline and sylvestrine habitats.

29. **Pulmonaria** [Tourn.] L. Sp. Pl. 135 (1753); Gen. Pl. 65 (1754).

Bessera Schult. Observ. Bot. 27 (1809).—A genus with about 12 ill-defined Eurasian species. It centers in southern Europe.

Eritrichieae.

Nutlets erect or suberect (or rarely horizontal), straight or slightly bent, smooth or verrucose or appendaged, margined or marginless; areola lateral or basal, at side of cotyledons or near their tip; gynobase pyramidal or columnar or rarely even flat; style entire; stigma 1, entire or very rarely somewhat emarginate, capitate or disciform; corolla blue or white or less commonly yellow or orange.—As a group the *Eritrichieae* are intermediate in degree of development between the *Lithospermeae* and the *Cynoglosseae*. Such genera as *Megastoma*, *Oreocarya*, and *Mertensia* are among the most primitive members of the tribe, whereas such genera as *Eritrichium*, *Lappula* and *Trigonotis* are the most specialized, coming nearest the *Cynoglosseae*. The

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tribe reaches its great development in Asia and in western America. The endemic American genera properly referable to this tribe are *Amsinckia, Cryptantha, Oreocarya,* and *Selkirkia.*

Key to Genera of Eritrichieae.

Nutlets circumdorsally winged, or with a definite upturned usually toothed or lacerate rim or flange, or some or all with an epidorsal annulate or cupulate crest, or pronouncedly angular and evidently tetrahedral.
- Gynobase flat; nutlets regularly tetrahedral, attached at one corner.
  - Style conspicuously long-exserted; anthers fully exposed; leaves crowded above, subverticillate.....30. *Brachybothrys.*
  - Style and anthers included; leaves scattered, alternate....31. *Trigonotis.*
- Gynobase pyramidal or columnar; nutlets not obviously and regularly tetrahedral.
  - Nutlets about equalling the elongate gynobase, attached for nearly their whole length, (with rare exceptions) exceeded by style.
    - Bracteate weedy annuals with narrow strigose canescent firm unnerved leaves; nutlet-margin toothed or lacerate, frequently glochidiate.....32. *Lappula.*
    - Ebracteate rank decorative perennial with broad glabrous herbaceous veiny leaves; nutlets with a broad merely undulate wing.....33. *Myosotidium.*
  - Nutlets much surpassing the stout pyramidal gynobase, attached obliquely supramedially by a deltoid or ovate areola, surpassing the style.
    - Nutlets with a circumdorsal, commonly lacerate or dentate margin.
      - Fruiting calyx reflexed; rank tufted plants with broad herbaceous leaves.....34. *Hackelia.*
      - Fruiting calyx erect or ascending; low densely caespitose plants with small firm leaves.....35. *Eritrichium.*
    - Nutlets (some or all of each fruit) with an epidorsal cupulate or annulate crest.
      - Stamens conspicuously exserted from the unappendaged corolla; nutlets with a subapical cupulate crest. 36. *Craniospermum.*
      - Stamens included within the appendaged corolla; some of nutlets with a thick medial dorsal annulate crest.....37. *Microula.*

Nutlets not encircled by a wing, rim, or flange, never bearing epidorsal annulate or cupulate crests, somewhat lanceolate or lenticular and never conspicuously angular or polyhedral.
- Corolla-lobes convolute in bud; style disciform, mucronate...38. *Myosotis.*
- Corolla-lobes imbricate in bud; style usually capitate.
  - Pericarp not fused along medial ventral line, nutlets hence more or less broadly grooved anteriorly.
    - Flowers fasciculate, falsely umbellate; diminutive Himalayan annuals.....39. *Microcaryum.*
    - Flowers loosely racemose; plants not diminutive.
      - Corolla appendaged, blue; nutlets several times as long as gynobase, attached suprabasally by a small areola; perennial; central Asia.....40. *Amblynotus.*

Corolla unappendaged, yellowish; nutlets broadly and laterally affixed to gynobase, exceeding it in length; annual; northern Africa.....41. *Megastoma.*
Pericarpial walls fused along medial ventral line, forming a medial ventral keel extending from areola to apex of nutlet.
Nutlets attached firmly to gynobase for nearly whole length.
Ovules 2; nutlets contorted.....42. *Rochelia.*
Ovules 4; nutlets not contorted.....43. *Oreogenia.*
Nutlets attached to gynobase through a definite areola.
Flowers solitary, terminal; nutlets densely pubescent; pulvinate Himalayan perennials.....44. *Chionocharis.*
Flowers several to many, inflorescence various; nutlets glabrous.
Fruiting calyx strongly accrescent, plicate, veiny, irregularly toothed and lobed; nutlets obliquely attached to an elongate strongly compressed gynobase.....45. *Asperugo.*
Fruiting calyx moderately if at all accrescent, not plicate, nor conspicuously veiny, nor irregularly toothed and lobed; gynobase pyramidal or flat.
Corolla tubular with a well developed campanulate or funnelform throat, tube surpassing calyx-lobes; nutlets usually smooth, attached basally or suprabasally.....46. *Mertensia.*
Corolla salverform, throat not differentiated, tube usually shorter than calyx-lobes; nutlets usually rough, attached ventrally suprabasally or medially.
Calyx somewhat accrescent, reflexed in age; corolla-tube exceeding nutlets; style very much surpassing nutlets.....47. *Anoplocaryum.*
Calyx practically non-accrescent, not reflexed; corolla-tube surpassed by calyx; style little if at all surpassing nutlets.....48. *Plagiobothrys.*

30. **Brachybothrys** Maxim. in Oliver, Hook. Icones xiii. 43, t. 1254 (1878).

With a single species, *B. paridiformis* Maxim., in southern Manchuria and adjacent Korea. Evidently a close ally of *Trigonotis*, and like it to be included in the *Eritrichieae*. It differs from its relative in its open subrotate corollas, conspicuously protruded stamens, and coarse habit.

31. **Trigonotis** Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 603 (1851).

Endogonia Lindl. Veg. Kingd. ed. 2, 656 (1847).—A genus with a dozen odd species in Asia and temperate Melanasia. Evidently a relative of *Eritrichium*. Though the nutlets appear to be basifixed, morphologically they are attached medially and laterally to a very

depressed gynobase. The decidedly tetrahedral nutlets are very characteristic of this and the preceding genus.

32. **Lappula** Moench, Meth. 416 (1794).

Lapula Gilib. Fl. Lithuan. i. 25 (1781), nom. nud. *Echinospermum* Sw. in Lehm. Asperif. i. 113 (1818). *Rochelia* R. & S. Syst. iv. pg. xi and 108 (1819). *Heterocaryum* A. DC. Prodr. x. 144 (1846). *Cynoglossospermum* [Siegesb.] Kuntze, Rev. Gen. ii. 436 (1891).—A natural, but difficult genus of 30 to 40 closely related species centering in central and southwestern Asia and having outlying species in Europe, Africa, Australia, and America. *Lappula spinocarpa* (Forsk.) Aschers. is aberrant in the arming of its nutlets. These agree with those of typical *Lappula* in size, outline and attachment, but differ in lacking a well defined toothed margin, being instead coarsely and irregularly muricate over the back. The habit of *L. spinocarpa* is so obviously that of the other species of *Lappula* that generic segregation of the species seems quite unacceptable.

The first generic name applied to the genus was that published by Gilibert in his Flora Lithuanica. Though he described the species, *Lapula* [sic!] *echinata* and indicated that it was synonymous with *Myosotis Lappula* L., Gilibert did not describe his genus, nor indicate any character whereby it might be recognized. Hence, according to the International Rules (Art. 38), it is a nomen nudum. The first characterization given the genus was by Moench. Although Gilibert's specific name was launched under a generic name not effectively published, it has, in recent years, been generally accepted for the common European representative of the genus.

33. **Myosotidium** Hook. Bot. Mag. lxxxv. t. 5137 (1859).

A monotype with the single species known only from Chatham Island, New Zealand. *Myosotidium hortensia* (Decne.) Baill. is a very decorative plant, and has its closest relatives in *Selkirkia* of Juan Fernandez and in the widely distributed genus *Hackelia*. Brand, Pflanzenr. iv. Fam. 252, 45 (1921), follows past authors in placing *Myosotidium* in the *Cynoglosseae*, but the erect nutlets and their attachment are clearly those of an *Eritrichica*.

34. **Hackelia** Opiz in Bercht. Fl. Boehm. ii. pt. 2, 146 (1839).

A genus of 25 to 30 species, most of which occur in western North America. Four species are known from the cooler parts of

Eurasia. The present study of the *Eritrichieae* has only increased my convictions, Contr. Gray Herb. n. s. lxviii. 43 (1923), that *Hackelia* is not immediately related to *Lappula*, but is related rather to *Eritrichium*, and that it merits the generic rank here accorded it.

35. **Eritrichium** Schrad. in Gaud. Fl. Helv. ii. 57 (1828).

Centering in Asia where there are perhaps 12 scarcely separable species. One species occurs on the high mountains of Europe, and several more are known from America. The genus is a natural one, and contains canescent perennial herbs characteristic of bleak plateaus or cold mountain-slopes. In the past the genus was vastly amplified, and at one time contained a large proportion of the *Eritrichieae*. As here defined, however, it is reduced to homogeneity and is a relatively small genus.

36. **Craniospermum** Lehm. Asperif. ii. 336 (1818).

Diploma Schrenk, Bull. Phys.-Math. Acad. St. Petersb. ii. 195 (1844).—A well marked genus with several closely related species in the Altai-Baikal region of Asia.

37. **Microula** Benth. in Benth. & Hook. Gen. Pl. ii. 853 (1876).

Trctocarya Maxim. Bull. Acad. St. Petersb. xxvii. 505 (1881); Mél. Biol. xi. 270 (1881). *Schistocaryum* Franch. Bull. Mens. Soc. Linn. Paris 930 (1891).—As Gray, Proc. Am. Acad. xx. 261 (1884), has suggested, this genus seems very closely related to *Plagiobothrys*. It differs, however, in normally having blue corollas, and at least several of the nutlets of each fruit bearing a characteristic epidorsal annulate crest. Except for the crest, the nutlets are quite indistinguishable from those of *Plagiobothrys* § *Euplagiobothrys*, and it may be that further study will give reasons for reducing *Macroula*. *Schistocaryum* is evidently a synonym. The peculiar dehiscence of the nutlets, which was the justification for proposing the genus, may have been caused by extreme pressure in drying fruiting material. It is to be noted, also, that the author later, Jour. de Bot. v. 105 (1891), admitted, because of habital similarity, other species to his genus which lacked the peculiar dehiscence. The species of *Schistocaryum* have the nutlets of *Microula*, and seem to be close relatives of *M. sikkimensis*. Indeed *S. myosotidium*, the type of its genus, seems so close to *M. sikkimensis* as to throw doubt on their specific distinctness. The following 9 species are referable to *Microula*. They occur

at high altitudes in the Himalayas, in Tibet, and in the mountains of western China.

1. MICROULA TIBETICA Benth. in Benth. & Hook. Gen. Pl. ii. 853 (1876); Maxim. Bull. Acad. St. Petersb. xxvi. 501 (1880); Mél. Biol. x. 682 (1880); Hemsley in Hook. Icon. xxvi. t. 2562 (1898); Hemsley, Jour. Linn. Soc. xxxv. 192 (1902). *M. Benthami* Clarke in Hook. Fl. Brit. India iv. 167 (1883); Oliver in Hook. Icon. xxiii. t. 2257 (1893). *Tretocarya pratensis* Maxim. Bull. Acad. St. Petersb. xxvii. 505 (1881); Mél. Biol. xi. 272 (1881).—Tibet and adjacent Himalayas.

2. M. TANGUTICA Maxim. Bull. Acad. St. Petersb. xxvi. 500 (1880); Mél. Biol. x. 682 (1880).—Northwestern China. Doubtfully distinct from *M. tibetica.*

3. M. PUSTULATA (Clarke) Duthie, Kew Bull. 1912, pg. 39 (1912). *Eritrichium pustulatum* Clarke in Hook. Fl. Brit. India iv. 164 (1883). —Himalayas.

4. M. SIKKIMENSIS (Clarke) Hemsley in Hook. Icon. xxvi. sub t. 2562 (1898). *Anchusa sikkimensis* Clarke in Hook. Fl. Brit. India iv. 168 (1883). *Tretocarya sikkimensis* Oliver in Hook. Icon. xxiii. t. 2255 (1893).—Himalayas and adjacent Tibet.

5. **M. myosotidea** (Franch.), comb. nov. *Schistocaryum myosotideum* Franch. Bull. Mens. Soc. Linn. Paris 930 (1891).—Yunnan.

6. **M. ciliaris** (Bur. & Franch.), comb. nov. *Schistocaryum ciliare* Bur. & Franch. Jour. de Bot. v. 105 (1891).—Szechwan.

7. **M. ovalifolia** (Bur. & Franch.), comb. nov. *Schistocaryum ovalifolium* Bur. & Franch. Jour. de Bot. v. 105 (1891).—Szechwan.

38. **Myosotis** L. Sp. Pl. 131 (1753); Gen. Pl. 63 (1754).

Scorpioides Gilib. Fl. Lithuan. i. 20 (1781). *Exarrhena* R. Br. Prodr. 495 (1810). *Strophiostoma* Turcz. Bull. Soc. Nat. Moscou xiii. pt. 2, 258 (1840).—A cosmopolitan genus of about 50 species, having two important distributional centers, one in Europe and the other in New Zealand. Attempts have been made to segregate, as a genus *Exarrhena,* those New Zealand species having large flowers and conspicuous stamens. As Cheeseman, Man. N. Zealand Fl. 458 (1906), has indicated, however, there appear to be no characters whereby this segregation can be sharply and naturally made. The large-flowered New Zealand species are clearly related to the European ones, having quite similar nutlets, nutlet-attachment, style, corolla-attachment, uncinate pubescence, and frequently even the same habit, and since there are undoubted transitional forms it seems best to treat *Exarrhena* as a section of *Myosotis.* *Myosotis sparsiflora* Mikan

and allies have been grouped to form the genus *Strophiostoma*, characterized by its conspicuous exserted strophiole. Though well developed in *Strophiostoma*, the character is somewhat developed in many species of true *Myosotis*. This tendency towards a strophiolate condition is very suggestive of the *Anchuseae*, and it is a notable fact that the only other member of the subfamily with contorted corolla-lobes (i.e., *Trigonocaryum*) has been placed in that tribe. *Myosotis*, however, does not have a habit at all suggestive of the *Anchuseae*, nor a tumid rim surrounding the nutlet-attachment, while furthermore its habit, somewhat margined nutlets, and peculiar solitary stigma make it much more at home in the *Eritrichieae*. Because of its practically basally attached nutlets, the genus in the past has been referred to the *Lithospermeae*, but its habit, compressed slightly margined nutlets, solitary disciform stigmas, and blue corollas seem to indicate stronger affinities in the *Eritrichieae*.

39. **Microcaryum**, gen. nov.

Calyx 5-fidus, lobis angustis, fructifer immutatus. Corollae tubus cylindricus calyce paulo brevior, fauce fornicibus 5 emarginatis clausa, lobi 5 ovati imbricati obtusi breves patentes. Stamina 5 tubo affixa inclusa, filamentis brevibus et antheris ovatis minimis obtusis. Ovarii lobi 4 in gynobasi elongata laterales, stylus inter lobos brevis, stigmate subcapitato, ovula lateraliter affixa. Nuculae 4 erectae immarginatae dorso convexae rugosae et tuberculatae medie longitudinaliter carinatae ventre obtusae medie sulcatae sulco longitudinali basi divaricatim furcato ab ima basi fere ad medium gynobasi columnari affixae. Semina recta, cotyledones planae indivisae.—Herba annua pernana himalayana villosa. Folia alterna oblanceolata obtusa. Inflorescentia pseudo-umbellata, floribus in fasciculos plures spicate dispositis. Corolla alba minima hypocraterimorpha. Pedicellae elongatae erectae. (Name from μικρός, *small*, and κάρυον, *nut*, in reference to the minute size of the nutlets.)

Although it has been associated with *Eritrichium*, this monotype is not at all closely related there, appearing rather to have its closest affinities in *Cryptantha*. *Microcaryum* differs from *Eritrichium* in habit, inflorescence, and in the shape and attachment of its nutlets. It agrees with *Cryptantha* in all floral and fruiting structures, and has quite similarly shaped and attached nutlets, but differs, however, in its habit, falsely umbellate inflorescence, villous pubescence, and widely separated range. *Microcaryum* occurs at very high altitudes in the Himalayas and adjacent Tibet, whereas *Cryptantha* grows on

the deserts and warm mountain-slopes at relatively low altitudes, from Alaska to Mexico, and Peru to Chile.

Microcaryum pygmaeum (Clarke), comb. nov. *Eritrichium pygmaeum* Clarke in Hook. Fl. Brit. India iv. 165 (1883). *E. Riae* Winkl. in Fedde, Repert., Beiheft. xii. 473 (1922).

40. **Amblynotus**, gen. nov.

Calyx 5-fidus, lobis angustis elongatis, fructifer paullo accrescens. Corollae hypocraterimorphae tubus brevis calyce brevior, fauce fornicibus 5 obtusis clausa; lobi 5 imbricati obtusi patentes. Stamina 5, tubo affixa inclusa, filamentis brevibus; antherae oblongae obtusae. Ovarii lobi 4 in gynobasi pyramidali erecti; stylus inter lobos brevis; stigmate subcapitato disciformi; ovula erecta. Nuculae 4 erectae emarginatae, dorso convexae obscure rugulosae nitidae glaberrimae, ventre basin versus cum areola triangulari obliqua instructae supra areolam secus angulum interiorem sulcatulae. Semina recta; cotyledones planae indivisae.—Herba perennis asiatica caespitosa sericovillosa strigosa. Folia alterna obtusa oblanceolata. Racemi simplices bracteati. Corolla coerulea.—*Eritrichium* § *Amblynotus* A. DC. Prodr. x. 128 (1846).

Amblynotus has been confused with *Eritrichium* which it somewhat suggests in habit and pubescence, but from which it differs in the attachment and form of its nutlets, since these are suprabasally attached by an areola which is prolonged above into a usually closed groove, and are polished and rounded and quite lack any suggestion of the dorsal marginal crests characteristic of *Eritrichium*. The proposed genus is probably related to *Cryptantha*, though not very closely so, differing in habit and pubescence, as well as in the color and texture of the corolla. *Amblynotus* seems to be a very distinct genus well worthy of recognition. It surely can not be left in *Eritrichium* if the latter is to be naturally defined.

Amblynotus obovatus (A. DC.), comb. nov. *Eritrichium oboratum* A. DC. Prodr. x. 128 (1846); Ledeb. Fl. Ross. iii. 152 (1847–9); Herder, Act. Hort. Petrop. i. 540 (1872). *Myosotis obovata* Ledeb. Fl. Altaica i. 190 (1829).

41. **Megastoma** Coss. & Dur. in Bonn. & Barr. Cat. Pl. Tunis 301 (1896).

A single species, *M. pusillum* Coss. & Dur., occurring in Algeria and Tunis. Although referred to *Eritrichium* by Bentham & Hooker, Gen. Pl. ii. 851 (1876), it is not at all closely related to that genus

though it does approach *Crypiantha* which Bentham & Hooker also reduced to *Eritrichium*. *Megastoma* differs from *Cryptantha* in its nude, unappendaged corolla-throat, very irregular calyx, and opposite branching; and of course has a widely separated range. A beautiful illustration of the plant has been given by Bonnet & Barratte, Ill. Phaner. Tunis t. 11, fig. 4–11 (1895).

42. **Rochelia** Reichb. Flora vii. 243 (1824); Icon. Crit. ii. 13, t. 123 (1824).

Maccoya F. Muell. Fragm. Austr. i. 127 (1859).—An anomalous genus of 10 to 15 species, centering in southwestern Asia and ranging from central Asia to the Mediterranean Basin. One species occurs in Australia. Although properly placed in the tribe *Eritrichieae* by Bentham & Hooker, Gen. Pl. ii. 836 (1876), Gürke, E. & P. Pflanzenf. iv. Abt. 3, 131 (1895), associated it with the American genus *Harpagonella* to form the tribe *Harpagonelleae*. A study of the nutlets and their attachment in *Harpagonella* and *Rochelia* should convince anyone that Gürke's tribe is clearly an artificial association of two only distantly related, anomalous, biovulate annuals. *Rochelia* fits clearly and naturally into the *Eritrichieae*, probably nearest *Lappula*, but *Harpagonella*, as pointed out on another page, is a *Cynoglosseu*. The correct combination for the Australian species of *Rochelia* appears to never have been made.

Rochelia plurisepalea (F. Muell.), comb. nov. *Maccoya plurisepalea* F. Muell. Frag. Austr. i. 127 (1859). *R. Maccoya* F. Muell. in Benth. Fl. Austr. iv. 408 (1869).

43. **Oreogenia**, gen. nov.

Calyx 5-fidus, lobis angustis, fructifer immutatus. Corollae tubus cylindricus intus infra medium transverse plicatus, calyci subaequalis; fauce fornicibus 5 obtusis clausa; lobi 5 orbiculares imbricati obtusi breves patentes. Stamina 5 tubo affixa inclusa, filamentis brevibus; antherae ovatae minimae obtusae. Ovarii lobi 4, in gynobasi elongata erecti; stylus inter lobos brevis, stigmate truncato plano vel concavo; ovula lateraliter affixa. Nuculae 4 lanceolatae immarginatae erectae, in facie interiori longitudinaliter carinatae carina ab ima basi fere ad apicem gynobasi columnari firmiter affixae, dorso rugosae strigoso-hispidulosae convexae medie carinatae. Semina recta; cotyledones planae indivisae.—Herba annua pumila villosa himalayana. Folia alterna obtusa oblanceolata. Racemi bracteati. Corolla coerulea.—(Name from ὄρος, *mountain*, and γενεά, *birth*.)

An Himalayan monotype which has been mistakenly referred to *Eritrichium*, a genus which is obviously not a close relative and which differs much in its perennial habit and margined broadly attached nutlets. The nutlets of *Oreogenia* are attached along the length of the keeled inner face.

Oreogenia Munroi (Clarke), comb. nov. *Eritrichium Munroi* Clarke in Hook. Fl. Brit. India iv. 165 (1883). *E. densiflorum* Duthie, Kew Bull. 1912, pg. 39 (1912).

44. **Chionocharis**, gen. nov.

Calyx 5-partitus, lobis lineari-spathulatis, fructifer immutatus. Corollae tubus calyci subaequalis, fauce fornicibus 5 obtusis clausa; lobi 5 imbricati obtusi patentes. Stamina 5 tubo affixa inclusa, filamentis brevibus; antherae ovatae obtusae. Ovarii lobi 4 in gynobasi pyramidali erecti; stylus inter lobos brevis, stigmate disciformi mucronato; ovula erecta. Nuculae 4 vel abortu pauciores erectae immarginatae strigoso-pubescentes dorso convexae laeves ventraliter obtusae cum areola parva triangulari supra basin ornatae. Semina recta, cotyledones planae indivisae.—Herba perennis himalayana pulvinata. Folia alterna numerosissima confertissime imbricata obtusa lata. (Name from χιών, *snow*, and χάρις, *beauty*.)

A remarkably distinct monotype of the Himalayas. The species has passed as a *Myosotis*, and indeed it does suggest in gross habit such New Zealand species as *M. uniflora* Hook. and *M. pulvinaris* Hook., but it is readily distinguished by its spathulate calyx-lobes, imbricate corolla-lobes, and laterally (suprabasally) affixed lanceolate very pubescent nutlets.

Chionocharis Hookeri (Clarke), comb. nov. *Myosotis Hookeri* Clarke in Hook. Fl. Brit. India iv. 174 (1883).

45. **Asperugo** L. Sp. Pl. 138 (1753); Gen. Pl. 67 (1754).

A European monotype now widely disseminated as a weed. The plicate accrescent calyces of this plant are highly characteristic, and its nutlets also distinctive. The latter are strongly flattened with the small circular areola placed above the middle and clearly to one side of the medial line. The gynobase is strongly compressed.

46. **Mertensia** Roth, Cat. Bot. i. 34 (1797).

Pneumaria Hill, Veg. Syst. vii. 40 (1764). *Casselia* Dumort. Comment. Bot. 21 (1822). *Steenhammerea* Reichb. Fl. Germ. Excur.

i. 337 (1831). *Platynema* Schrad. Ind. Sem. Hort. Goetting. (1835); Linnaea Litt. (1837) 89. "*Winkleria* Reichb. Nom. 236 (1841)." *Hippoglossum* Hartm. ex Lilja. Linnaea xvii. 111 (1843). *Orocharis* Lindl. Veg. Syst. ed. 2, 656 (1847). *Cerinthodes* [Ludw.] Kuntze, Rev. Gen. ii. 436 (1891).—With 50 to 60 species in the temperate portions of Eurasia and North America, most of them in western United States. The genus exhibits a number of diverse trends, which in a few instances have been given generic recognition, e. g. *Pneumaria* for *M. maritima* and allies, and *Orocharis* for the racemose Himalayan species related to *M. echioides*. The recognition of *Pneumaria* would set the generic values too low, and logically compel the recognition of monotypic genera for such species as *M. virginica* (L.) DC., *M. rivularia* DC., *M. bella* Piper, etc. This seems quite inadvisable since *Mertensia* in the broad sense is a natural and readily recognized entity. On account of its usually basifixed nutlets *Mertensia* has been placed in the *Lithospermeae*. Its relations, however, appear to be rather in the *Anchuseae* or the *Eritrichieae*. *Mertensia* has much in common with *Pulmonaria*, in fact the most important difference seems to be the absence on its nutlets of a plug-shaped strophiole surrounded by a tumid rim. On account of this difference, and because the nutlets are frequently attached obliquely or suprabasally by a flat areola, as well as from its abundance in western North America,—a region without any indubitable native anchusoid borages, I have thought it best to place the genus in the *Eritrichieae*. The style of *Mertensia* is almost always single.

47. **Anoplocaryum** Ledeb. Fl. Ross. iii. 154 (1847).

A monotype known only from Transbaikalia. The genus has received practically no recognition since its publication, being considered at most only a section of *Eritrichium* or *Echinospermum*. It is certainly distinct, however, from *Eritrichium* and *Echinospermum* since it has a very different habit, glabrate herbage, firm reflexed calyces, and unmargined and very differently attached nutlets. *Anoplocaryum compressum* (Turcz.) Ledeb. appears to be a close ally of *Mertensia*, from which it differs in the corolla-shape and nutlet-attachment.

48. **Plagiobothrys** Fisch. & Mey. Ind. Sem. Hort. Petrop. ii. 46 (1835).

Allocarya Greene, Pittonia i. 12 (1887); Johnston, Contr. Gray Herb. n. s. lxviii. 64 (1923). *Havilandia* Stapf, Trans. Linn. Soc.

ser. 2, Bot. iv. 209 (1894).—A very large American genus with a few representatives in the Old World. Of the section *Allocarya* there are two species within our limits, one in Australia and another in Kamchatka, the former probably derived from South America and the latter evidently from North America. A careful study of *Havilandia* has convinced me that its species, which occur at high altitudes in the East Indian Islands, should be placed under *Plagiobothrys*. If these species had opposite lower leaves they would be referable to the section *Allocarya*, since they have sheathing leaf-bases like many members of that section, and nutlets which in shape and attachment are indistinguishable from it. The nutlets are smooth, but so are those of *P. lithocaryus* and several other species. The resemblance in gross habit between *Havilandia borneensis* Stapf and *P. linifolius* is remarkable, cf. HBK. Nov. Gen. et Sp. iii. t. 200 (1818) (as *Anchusa oppositifolia*), and Stapf, l. c., t. 16a (1894). The Havilandias have been referred to *Lithospermum*, but they are obviously of the *Eritrichieae* and of the above mentioned relationship.

§ Allocarya (Greene) Johnston.—Leaves opposite, at least toward root, usually somewhat sheathing; flowers axillary or in spicate racemes; nutlets usually with a suprabasal non-carunculate areola.

1. Plagiobothrys australasicus (A. DC.) Johnston, Contr. Gray Herb. n. s. lxviii. 66 (1923). *Eritrichium australasicum* A. DC. Prodr. x. 134 (1846); Benth. Fl. Austral. iv. 406 (1869). *Allocarya australasica* Greene, Erythea iii. 57 (1895). *Heliotropium elachanthum* F. Muell. Linnaea xxv. 424 (1852).—Southern Australia.

2. **P. asiaticus** (Kom.), comb. nov. *Allocarya asiatica* Kom. in Fedde, Repert. xiii. 236 (1914). *Eritrichium plebejum* var. *tenue* Herder, Act. Hort. Petrop. i. 542 (1872).—Kamchatka.

§ Havilandia (Stapf) Johnston.—Leaves alternate, broadly attached and somewhat sheathing; flowers axillary; nutlets with suprabasal, small, non-carunculate areola.

3. **P. borneensis** (Stapf), comb. nov. *Havilandia borneensis* Stapf, Trans. Linn. Soc ser. 2, Bot. iv. 209, t. 16a (1894). *Lithospermum borneense* Boerl. Handl. Fl. Nederl. Ind. ii pt. 2, and 488 (1899); Merrill, Enum. Born. Pl. 511 (1921).—British North Borneo.

4. **P. minutus** (Wernh.), comb. nov. *Lithospermum minutum* Wernh. Trans. Linn. Soc. ser. 2, Bot. ix. 118 (1916).—Dutch New Guinea.

5. **P.** (?) **Zollingeri** (A. DC.), comb. nov. *Lithospermum Zollingeri* A. DC. Prodr. x. 587 (1846); Miquel, Fl. Ind. Batav. ii. 930 (1857); Boerl. Handl. Fl. Nederl. Ind. ii. pt. 2, 485 and 488 (1899); Koorder, Exkur. Fl. Java iii. 131 (1912).—Java. This is evidently not a

Lithospermum, and though the habit of growth and elongate corolla-tube are different from those of indubitable Havilandias, it seems best referred to *Havilandia* until good fruiting material becomes available.

Cynoglosseae.

Nutlets ascending or divergent or rarely even inverted (*Harpagonella* and *Bothriospermum*) or suberect, straight or slightly bent, appendaged or verrucose or smooth, usually margined; areola lateral to apical, near the radicle, unmargined, without strophiole; gynobase columnar or pyramidal or flat; style entire; stigma 1, capitate; corolla blue or white.—The most highly evolved tribe in the subfamily if not in the family. Its outstanding features are adradicular nutlet-attachment and commonly appendaged or margined nutlets. Although cosmopolitan in distribution it centers in southwestern Asia and the eastern Mediterranean Basin. *Harpagonella*, the most evolved member of the tribe, comes from western North America. There are only three endemic American genera of this tribe; they are *Mimophytum*, *Pectocarya*, and *Harpagonella*.

Key to Genera of Cynoglosseae.

Apex of anthers subulate and contorted.
- Corolla-throat unappendaged.....49. *Trichodesma.*
- Corolla-throat with ten intruded triangular appendages.....50. *Lacaitaea.*

Apex of anthers obtuse or apiculate, not subulate and contorted.
- Anthers strongly heteromorphous, the upper one several times larger than others.....51. *Caccinia.*
- Anthers homomorphous, all of equal size.
  - Gynobase inflated, globose; nutlets with entire inner face permanently affixed to gynobase, only one maturing...52. *Suchtelenia.*
  - Gynobase solid, flat or pyramidal or subulate; nutlets with ventral face only partially affixed to gynobase, deciduous, usually several maturing.
    - Nutlets with straight or uncinate unicellular hairs, never tuberculate nor with multicellular glochidiate appendages, rarely smooth and glabrous but then always with stamens included.....53. *Omphalodes.*
    - Nutlets with some multicellular glochidiate appendages or evidently tuberculate, rarely smooth and glabrous but then with stamens always exserted.
      - Nutlets covered with glochidiate appendages, marginless or with a weakly developed margin that is thick and glochidiate or is evidently formed by the basal fusion of the lateral appendages.....54. *Cynoglossum.*
      - Nutlets with very few glochidiate appendages or surface tuberculate or even smooth, with a well developed rather wide cartilaginous margin (this tumid in *Bothriospermum*).
        - Stamens exserted; fruit smooth and glabrous or nearly so.

Corolla cylindrical with erect lobes; attachment-face of nutlets free above and decurrent on the style; Eurasian. . . . . 55. *Rindera*.
Corolla salverform, lobes divergent; attachment-face of nutlets sessile, not decurrent. . . . . 56. *Tysonia*.
Stamens included; fruit evidently tuberculate or glochidiate.
Nutlets with a small apical or subapical attachment.
Nutlets tuberculate, with a double margin.
Nutlets inverted, parallel, with backs proximate, margin low, tumid and inconspicuous. . . . . 57. *Bothriospermum*.
Nutlets divergent, with backs upturned, margins conspicuous, well developed. . 58. *Thyrocarpus*.
Nutlets glochidiate, with a single margin. . . . 59. *Actinocarya*.
Nutlets with an elongate lateral attachment, commonly decurrent on style, rarely tuberculate, margin single. . . . . 60. *Paracaryum*.

49. **Trichodesma** R. Br. Prodr. 496 (1810).

Pollichia Meaic. Bot. Beobacht. 247 (1783). *Borraginoides* Moench, Meth. 515 (1794). *Friedrichsthalia* Fenzl in Endl. Nov. Stirp. Dec. 53 (1839). *Leiocarya* Hochst. Flora xxvii. 30 (1844). *Streblanthera* Steud. in Hochst. Flora xxvii. 29 (1844). *Spiroconus* Stev. Bull. Soc. Nat. Moscou xxiv. pt. 1, 576 (1851). *Boraginella* [Siegesb.] Kuntze, Rev. Gen. ii. 435 (1891).—About 40 species in the warmer parts of Asia, Africa, and Australia. The genus has been recently monographed by Brand, Pflanzenr. iv. Fam. 252, 19–44 (1921).

50. **Lacaitaea** Brand in Fedde, Repert. xiii. 81 (1914).

A single species, *L. calycosa* (Coll. & Hemsley) Brand, in the eastern Himalayas. I know the genus only from the literature. The latest discussion of it is that given by Brand, Pflanzenr. iv. Fam. 252, 44 (1921).

51. **Caccinia** Savi, Cose Bot. 1, t. 1 (1832).

Anisanthera Raf. Fl. Tell. iii. 80 (1836). *Heliocarya* Bunge, Helioc. 4 (1871).—About 7 species in western Asia. *Heliocarya* has been maintained as a monotypic genus, but its relations with *Caccinia* are patent and its distinguishing characters are merely the culmination of trends well developed in that genus. These facts seem to justify the following combination.

Caccinia monandra (Bunge), comb. nov. *Heliocarya monandra* Bunge, Helioc. 4 (1871); Brand, Pflanzenr. iv. Fam. 252, 94 (1921).

52. **Suchtelenia** Karelin in Meissn. Gen. i. 279; ii. 188 (1840); Bull. Soc. Nat. Mosc. 16, t. 2 (1841).

A monotype of the southern Caspian Sea basin. An anomalous plant with a narrowly ovoid, inflated gynobase. The nutlets, several of which are usually aborted, are borne with their inner face entirely adnate to the hollow gynobase. The best description of the genus is that given by Popow in the Flora Caucasica Critica, iv. pt. 2, 101 (1913). The description and analytic figures given by Brand, Pflanzenr. iv. Fam. 252, 161, fig. 22 (1921), are misleading.

53. **Omphalodes** [Tournef.] Moench, Meth. 419 (1794).

Picotia R. & S. Syst. iv. x (1819). *Omphalium* Roth, Enum. Pl. Germ. i. 590 (1827).—About 24 species in Eurasia and Mexico. *Omphalodes scorpioides* has a strongly recurved radicle, opposite lower leaves, and may be worthy of generic recognition, though no special generic name has ever been associated with it.

54. **Cynoglossum** [Tournef.] L. Sp. Pl. 134 (1753); Gen. Pl. 65 (1754).

Solenanthus Ledeb. Icon. Fl. Ross. i. 8, t. 26 (1829). *Lindelofia* Lehm. Hamb. Gart. u. Blumenzeitung vi. 351 (1850). *Anchusopsis* Bisch. Del. Sem. Hort. Heidelberg. 8 (1852). *Trachelanthus* Kunze, Bot. Zeitung viii. 665 (1850). *Kuschakewiczia* Regel & Smirnow, Act. Hort. Petrop. v. pt. 2, 625 (1878). *Adelocaryum* Brand in Fedde, Repert. xiii. 547 (1915).—A cosmopolitan genus of 80 to 90 species, with the center of distribution in southern Europe and Asia. The species with exserted stamens have been segregated to form the genus *Solenanthus*, but this staminal difference is developed in various degrees and is not correlated with any character of corolla, fruit, or habit, these latter characters, in fact, being the exact duplicates of those found in *Cynoglossum*. In *Lindelofia* the stamens are barely extruded, thereby showing unmistakable transition between the staminal developments characteristic of *Solenanthus* and *Cynoglossum*. Brand separates *Lindelofia*, and the obviously related *Adelocaryum*, from *Solenanthus* and *Cynoglossum* by attributing to the two former, nutlets which touch one another while in the bud, and to the two latter, nutlets which are separated from the beginning. These characters are not only very difficult to use, but in most instances are inconclusive, and I am convinced that the supposed differences are not of particular phylogenetic importance. No attempt is made here to put on record the numerous combinations rendered necessary by

this amplification of the generic limits of *Cynoglossum*, but the following species, incorrectly referred to *Paracaryum*, may be transferred.

Cynoglossum Thomsoni (Clarke), comb. nov. *Paracaryum Thomsoni* Clarke in Hook. Fl. Brit. India iv. 161 (1883).

55. **Rindera** Pallas, Reise i. 486 (1771).

Mattia Schult. Obs. Bot. 30 (1809). *Cyphomattia* Boiss. Fl. Orient. iv. 272 (1875). *Bilegnum* Brand in Fedde, Repert. xiii. 549 (1915).—About 15 species, most of them in western Asia and adjacent Europe.

56. **Tysonia** Bolus in Hook. Icon. xx. t. 1942 (1890).

A South African monotype which is unrepresented in the Gray Herbarium. The plant originally figured by Bolus has peculiar subdisciform, unarmed, and winged nutlets, characters which, substantiated by the odd corolla-developments, seems to furnish ample justification for the recognition of the genus. The plant described and figured by Brand, Pflanzenr. iv. Fam. 252, 88, fig. 11 (1921) is obviously quite different in fruiting structures, having the depressed, broadly ovoid, densely glochidiate, wingless nutlets of a *Cynoglossum*.

57. **Bothriospermum** Bunge, Enum. Pl. China Bor. 47 (1835).

See Roy. Soc. Cat.

A well-marked genus of 3 to 4 species, all of them occurring in China and one of them ranging from northern India to Manchuria and on the Japanese, Philippine, Mascarene, and Hawaiian islands. Though this genus has been placed in the *Eritrichieae* it seems clear that its proper position is in the *Cynoglosseae* next to *Thyrocarpus*. *Bothriospermum* and this relative are remarkably similar in general habit and in floral structures, in fact appear to differ only in the direction of their nutlets and in the degree to which the dorsal margining is developed on the latter. The two genera agree in having the attachment-surface of their verrucose nutlets proximate to the radicle end of the seed, or in other words have nutlets morphologically apical in attachment. In *Thyrocarpus* the nutlets are divergent, but in *Bothriospermum* they are inverted, parallel and with their backs together. In *Bothriospermum* the peculiar scar above the nutlet-attachment, which has been frequently mistaken for the real attachment-scar, is, hence, morphologically the equivalent of the dorsal cupulate structure on the nutlets of *Thyrocarpus*. The tumid margin of the scar on the back of the nutlets of *Bothriospermum* is the homologue of the outer lobed dorsal margin on the nutlets of *Thyrocarpus*,

and the cartilaginous veil within the tumid rim is the homologue of the inner one of the double margin of *Thyrocarpus*. The cartilaginous veil, well developed in *Bothriospermum*, is also present, but early evanescent, in numerous species of *Omphalodes* and *Paracaryum*.

58. **Thyrocarpus** Hance, Ann. Sci. Nat. ser. 4, xviii. 225 (1862).

A chinese genus of 3 species.

59. **Actinocarya** Benth. in Benth. & Hook. Gen. Pl. ii. 846 (1876).

An interesting monotype from Tibet. According to Brand, Pflanzenr. iv. Fam. 252, 15 (1921), this genus is to be excluded from the *Cynoglosseae* and associated with *Myosotis*, since its nutlets are said to be basifixed. My dissections of the type collection agree with the details in the plate given by Oliver, Hook. Icon. xxiii. t. 2257 (1893), and clearly point to a relationship in the *Cynoglosseae*. Not only do the nutlets bear glochidiate appendages and a coroniform dorsal crest suggestive of the *Cynoglosseae*, but the radicle end of the seed is next to the attachment-surface of the nutlet and, hence, the latter is unquestionably apical in attachment.

60. **Paracaryum** (A. DC.) Boiss. Diag. Pl. Orient. ser. 1, xi. 128 (1849).

Mattiastrum Brand in Fedde, Repert. xiv. 150 (1915).—With 40 to 45 species in the area between the eastern Mediterranean Basin and India. There seems to be no marked difference between *Paracaryum* and *Mattiastrum*.

2. Notes on miscellaneous American Boraginaceae.

Cryptantha latifolia, sp. nov., annua laxe ramosa 7–30 cm. alta; ramis breviter graciliterque hispido-strigosis et sparse setosis; foliis subdistantibus firmis oblongo-linearibus vel oblongis obtusis integerrimis 1–3.5 cm. longis 2.5–8(–10) mm. latis sessilibus concoloribus pustulato-setosis; spicis solitariis vel geminatis pauci- vel multibracteatis 3–12 cm. longis unilateralibus; floribus juventate congestis biseriatis maturitate remotis; calycibus maturitate ovoideis subsessilibus ascendentibus 2–4 mm. longis, lobis linearibus vel linearioblongis obtusis breviter hirsutis; corolla conspicua calycem multo superanti 2.5–5 mm. lata, lobis late obovatis 1.2–1.8 mm. longis albis; nuculis 4 triangulari-ovatis compressis fuscescentibus homomorphis

1.5–1.7 mm. longis apice acutis basi rotundo-truncatis dorso muricatis ventre verrucosis apice acutis, sulcis clausis vel infra medium anguste apertis basin versus divaricate furcatis; gynobasi quadrangulari-columnari ca. 1 mm. alta; stylo ca. 1 mm. longo nuculam ca. 0.5 mm. superanti.—PERU: loose stony upper slopes of sea-side hills, Chorrillos near Lima, about 150 m. alt., Sept. 15, 1923, *Macbride 5861* (TYPE, Field Mus. no. 536,865; ISOTYPE, Gray Herb.).—Differing from *C. limensis* (A. DC.) Johnston in its broad rotate corollas that much surpass the calyces, broad leaves, larger calyces, and acute ovate muricate nutlets that are about half the length of the calyx. From the briefly described *C. granulosa* (R. & P.) Johnston it differs in its broad leaves, loosely branched habit and muricate nutlets.

Cryptantha Macbridei, sp. nov., annua basaliter ramosa 5–15 cm. alta; ramis paucis ascendentibus adpresse hispidis; foliis oblanceolatis firmis integerrimis sessilibus saepe acutis 1–2 cm. longis 2–3 mm. latis saepe pustulato-setosis, superioribus reductis, inferioribus oppositis majoribus; spicis solitariis vel geminatis 3–12 cm. longis unilateralibus; floribus obscure biseriatis omnibus angusto-bracteatis maturitate 2–5 mm. separatis; calycibus fructiferis oblongis subsessilibus ascendentibus vel divaricatis 4–5.5 mm. longis basi conicis; lobis calycis oblanceolatis vel linearibus saepe acutis in costa infra medium cum setis flavescentibus horridis in marginibus adpresse hispidis, supra medium herbaceis paullo hispidis saepe recurvatis vel ascendentibus; corolla tubulosa calyce vix longiori ca. 2 mm. longa, lobis orbicularibus erectis ca. 0.5 mm. longis; nuculis 4 ovato-lanceolatis ca. 1.5 mm. longis fuscescentibus subnitidis verrucosis heteromorphis margine obtusis apice anguste acutis basi rotundatis ventre 3/5 longitudinis ad gynobasem quadrangulari-columnarem 1–1.2 mm. longam adfixis, sulcis clausis vel anguste apertis basi in areolam deltoideam semper dilatatis; nucula axillari persistenti dorso basin versus laeve quam nuculae consimiles sublongiori.—PERU: loose stony upper slopes of seaside hills, Chorrillos near Lima, about 150 m. alt., Sept. 15, 1923, *Macbride 5869* (TYPE, Field Mus. no. 536,873; ISOTYPE, Gray Herb.).—Collected with and somewhat resembling *C. latifolia*, but differing in its small tubular corollas, coarsely hirsute calyx-lobes with spreading herbaceous tips, and narrower verrucose heteromorphous nutlets. From the description of *C. limensis*, of which it appears to be a very close relative, it differs in its much larger (4–5 not 3 mm. long) calyces, spreading calyx-lobes, and verrucose nutlets.

Cryptantha peruviana, sp. nov., annua grisea subsimplex vel laxe ramosa 10–20 cm. alta adpresse villoso-hispida inconspicue pustulata; ramis gracilibus ascendentibus; foliis lanceolato-linearibus vel lineari-

bus ascendentibus integerrimis sessilibus acutis 1–3 cm. longis 1–2.5 mm. latis adpresse villoso-hispidis costa et marginibus hispido-ciliatis supra viridioribus, superioribus paullo reductis; spicis saepe evidenter geminatis rare ternatis vel solitariis ebracteatis 1–5 cm. longis unilateralibus; floribus uniseriatis maturitate 2–5 mm. separatis; calycibus fructiferis ovoideis sessilibus ascendentibus 2–4 mm. longis, lobis erectis linearibus vel lanceolato-linearibus in costa cum setis flavescentibus crassis pungentibus ornatis et in marginibus hispido-villosis; corolla tubulosa quam calyx sublongiori ca. 2 mm. longa, lobis orbicularibus ca. 0.3 mm. longis; nuculis 4 (rare 1–2 abortis) ca. 1.5 mm. longis lanceolato-ovatis compressis acutis pallidis rugoso-verrucosis dense minuteque granulatis quam lobi calycis 3 5 breviori-bus homomorphis margine acutis basi truncatis ventre $\frac{1}{2}$ longitudinis ad gynobasem quadrangulari-columnarem ca. 1 mm. longam affixa, sulcis apertis vel clausis; stylo ca. 0.6 mm. longo nuculas subsuperanti. —PERU: in loose rocks on dry slopes above Rio Blanco, about 3600 m. alt., May 8–19, 1922, *Macbride & Featherstone 674* (TYPE, Field Mus. no. 517,202; ISOTYPE, Gray Herb.); ravines and hillsides on southern slopes of El Chachani, north of Arequipa, alt. 3355 m. March 1920, *Mr. & Mrs. F. E. Hinkley 77* (G).—A very distinct species with an erect habit of growth, short ebracteate spikes, and pale tuberculate rugose nutlets. The five species of *Cryptantha* which are at present known from Peru may be distinguished by aid of the following

KEY TO THE PERUVIAN SPECIES OF CRYPTANTHA.

Corolla at anthesis twice length of calyx, limb broad.
  Leaves oblong-linear or oblong; nutlets muricate or verrucose...*C. latifolia.*
  Leaves linear; nutlets granulose.....*C. granulosa.*
Corolla tubular, always shorter than or barely exceeding calyx.
  Spikes naked, usually geminate; nutlets pale; leaves linear or lance-linear, very obscurely pustulate.....*C. peruviana.*
  Spikes bracteate, usually solitary; nutlets dark; leaves oblong or oblanceolate, conspicuously pustulate.
    Calyx 4–5 mm. long, lobes spreading or recurving above middle; nutlets verrucose.....*C. Macbridei.*
    Calyx 3 mm. long, lobes erect; nutlets granulate.....*C. limensis.*

Amsinckia hispida (R. & P.), comb. nov. *Lithospermum hispidum* R. & P. Fl. Peruv. ii. 5 (1799).—Ruiz & Pavon's specific name is the oldest in the genus, and hence should replace *A. angustifolia* Lehm., cf. Contr. Gray Herb. n. s. lxx. 44 (1924). The type of *A. hispida* was collected in the arid belt to the north of Lima, Peru.

Harpagonella Palmeri, var. **arizonica**, n. var., cornibus calycis quam ea formae typicae gracilioribus longioribus ca. 4 mm. longi-

tudine; nuculis paullo grandioribus.—ARIZONA: plains, Lowell, May 3, 1884, *W. F. Parish 162* (TYPE, Gray Herb.); near Tucson, April 1881, *Pringle 363;* Tucson, *Lemmon;* Tucson, 1877, *Greene 1110.*—The plant of Arizona currently referred to *H. Palmeri* Gray differs from that of California and Lower California in having more elongate cornute processes on the fruiting calyx and noticeably larger nutlets. The type of *H. Palmeri*, collected on Guadelupe Island by Palmer in 1875, is quite indistinguishable from the plant of coastal Southern California and adjacent Lower California.

Harpagonella was placed in a special tribe by Gürke, E. & P. Nat. Pflanzenf. iv. Abt. 3a, 130 (1895), and was so treated in a paper of my own, Contr. Gray Herb. n. s. lxx. 5 (1924). A recent detailed study of *Harpagonella*, however, has convinced me that it has been treated with too much dignity, and that it clearly falls into the *Cynoglosseae* next to *Pectocarya* as first indicated by Gray, Proc. Am. Acad. xi. 88 (1876).

Harpagonella has only two ovules. The nutlets which develop from these are somewhat different in shape, attachment, and pubescence. The axial nutlet (that next the distinct calyx-lobes) is pubescent on all faces, and is slightly shorter and more loosely affixed to the gynobase than is the abaxial nutlet. The abaxial nutlet is enclosed by the peculiarly modified abaxial calyx-lobes, and is pubescent only on the face proximate to the axial nutlet. In both nutlets the radicle-end of the seed is next the attachment-end of the nutlet, and hence, morphologically at least, the nutlets are apically attached. It is quite evident, therefore, that the nutlets must stand inverted with their backs juxtaposed. A close examination reveals a margin surrounding the pubescent inwardly facing side of the abaxial nutlet which further suggests that this is, indeed, morphologically the back of the nutlet. The style, gynobase, and corolla, the indurated recurved pedicels, and all the vegetative characters of *Harpagonella* are those of *Pectocarya*, a genus which also has very elongate nutlets apically attached, and hence there seems to be every reason for returning to the treatment of Gray, l. c., and Bentham & Hooker, Gen. Pl. ii. 846 (1876), placing the genus next to *Pectocarya* and considering it no more than a highly specialized and anomalous member of the *Cynoglosseae.*

PECTOCARYA LATERIFLORA (Lam.) DC. Prodr. x. 120 (1846). *P gracilis*, var. *boliviana* Johnston, Contr. Gray Herb. n. s lxx. 37 (1924).—The study of the material of *Pectocarya*, recently collected by Mr. J. F. Macbride in Peru, has convinced me that *P. gracilis*, var. *boliviana* is synonymous with *P. lateriflora*, since the habit-

difference, by which *P gracilis* and *P. lateriflora* were distinguished, has proved illusory. The three species constituting the § *Eupectocarya* appear to be remarkably similar in habit, differing only in the shape and arming of the nutlets. *Pectocarya lateriflora* is characterized by its obovate, rather than parallel-sided oblong-linear nutlets, and appears to represent its section in Peru and Bolivia. Weberbauer, Engler & Drude, Veg. Erde xii. 136, fig. 5 (1911), has given a suggestive, but not accurately detailed illustration of *P. lateriflora*.

Cynoglossum limense Willd. Sp. Pl. i. 762 (1798).—This species is based entirely upon a plate and description given by Feuillée, Jour. Obs. Phys. ii. 765, t. 49 (1714), who found the plant in the "vallée d'Ylo." As clearly shown by Feuillée's maps and discussion, the locality known to him as "Ylo" is the same as the port near the southern boundary of Peru now known under that name. The type of *C. limense*, hence, was not collected near Lima as Willdenow's inappropriate specific name, and Brand's statement, Pflanzenr. iv. Fam. 252, 142 (1921), would suggest. As the plant has not been reported from within 500 miles of Ylo it is possible that its reputed occurrence there is the result of some confusion of data.

Cynoglossum Trianaeum Wedd. Chlor. And. ii. 90 (1859).—A fine plate of this was published by Oliver, Hook. Icon. xxv. t. 2458 (1896). Brand, Pflanzenr. iv. Fam. 252, 136 (1921), apparently intended to cite this illustration, but part of his citation has been omitted and the remainder, the plate-number, was added to the citation to Weddell's Chloris Andina.

Cordia gerascanthus L. Syst. ed. 10, 936 (1759); not of Griseb. Fl. Brit. W. Ind. 478 (1861), nor Chodat, Bull. Soc. Bot. Genève ser. 2, xii. 209 (1920). *Gerascanthus* P. Browne Hist. Jamaica 170, t. 29, fig. 3 (1756). *C. gerascanthoides* HBK. Nov. Gen. et Sp. iii. 69 (1818). —In 1910 Urban, Symb. Antil. iv. 516, indicated that, as then used, the binomial, *Cordia gerascanthus* L., was incorrectly applied to the widely distributed tree with canescent, densely stellate calyces, and that the name is properly applicable to the relatively localized species of the West Indies and southern Mexico which has glabrous or sparingly hirsute calyces and larger flowers, and which was described and current as *C. gerascanthoides* HBK. Ten years later, in his paper on *Cordia* § *Gerascanthus*, Chodat, l. c., declared Urban's interpretation of *C. gerascanthus* L. to be incorrect and used the name in the traditional sense, applying it to the widely distributed plant with stellate calyces. Further examination of this matter has recently been made to determine the correct specific name for use by

Dr. W. M. Wheeler in his publications on myrmecophytes. For the convenience of others the results of this study are here put on record.

Cordia gerascanthus L. is based upon the Jamaican plant which Patrick Browne, l. c., described and figured under the name "*Gerascanthus.*" Browne's illustration, showing only the floral structures, portrays a corolla of large size which has broad short obtuse lobes with conspicuous pinnate veining, a broad saucer-shaped throat, a stocky weakly ribbed calyx, and deltoid calyx-lobes. These characters definitely associate Browne's plant with *C. gerascanthoides* HBK. and prohibit the use of the Linnean name for the plant with stellate calyces. It is to be also noted that not only does Grisebach, l. c., cite Browne's figure under "*C. gerascanthoides* HBK.," but he gives *C. gerascanthoides* HBK. as "common in the lowlands and mountains" of Jamaica, and gives the plant with stellate calyces (under *C. gerascanthus* Jacq.) as "rare" on that island. Browne's plant was not rare, for he speaks of it as follows, "This tree grows in many parts of Jamaica, and is generally esteemed as one of the best timber woods in the island; it rises to considerable height, . . . , especially in the low-lands, where it is most common, ..." It is significant that concerning the Jamaican occurrence of the plant with stellate calyces, Urban, l. c. (under *C. alliodora* Cham.), comments parenthetically as follows, "fortasse a cl. Wilson introducta ex cl. Stapf. in lit." Since the identity of *C. gerascanthoides* HBK. and *Gerascanthus* Browne is certain from a study of Browne's plate and description, and from distributional considerations, it is evident that *Cordia gerascanthus* L. is, indeed, improperly applied to the widely distributed plant with stellate calyces. Among its close relatives in the West Indies and Central America, *C. gerascanthus* L. is readily recognized by its large flowers, saucer-shaped throat hirsute or glabrescent stout weakly ribbed calyx-tube, and deltoid calyx-lobes. It is known only from Cuba!, Isle of Pines!, Jamaica!, southern Mexico!, and northern Central America. As Urban, Symb. Antil. iv. 516 (1910) and viii. 574 (1921), has pointed out, *Cordia alliodora* (R. & P.) Cham. is the correct name for the widely distributed plant with stellate calyces, or, in other words, for the one incorrectly current as "*C. gerascanthus.*" *Cordia alliodora* ranges from Mexico and the West Indies southward along the Andes to Bolivia. A number of critical species, doubtfully distinct from it, have been described from southern Brazil, adjacent Paraguay, and Argentina.

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STUDIES IN THE BORAGINACEAE.—IV.

THE NORTH AMERICAN SPECIES OF CRYPTANTHA.

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THE NORTH AMERICAN SPECIES OF CRYPTANTHA.

The genus *Cryptantha* is a group of annual herbs centering in western America and belonging to the tribe *Eritrichieae* of the family *Boraginaceae*. It has long been recognized as a genus of decided difficulty. This is due both to the variability of its species and to the minute size of the fruiting and floral structures which, as experience has shown, are the only satisfactory basis for precise specific differentiation. In recent years the mass of collected material of this genus has become so large, and the failure of the provisional classification of the earlier authors so patent, that the need of a thorough restudy and reclassification of the group has been increasingly apparent. It is hoped that the present monograph of the North American species will partially meet this obvious need and to some extent bring order out of the chaos that has caused so many botanists to neglect this technical but highly interesting group of West American plants.

Preliminary studies of the North American species of *Cryptantha* were begun by the writer at the University of California in 1920. Intermittently the work has been continued up until the present. During this time many species have been seen in the field and types and critical material have been studied in several of the major herbaria of the United States. The present treatment was prepared at Harvard University and is based upon the material in the Gray Herbarium and the University of California Herbarium, and such other material as has been borrowed during the final critical study of the genus. The mass of material of *Cryptantha* from the herbarium of the University of California has been invaluable, since it is replete with authentic fragments, particularly of the species described by Greene, and since it consists in large part of the critical and extensive accumulations of Mrs. Katherine Brandegee, who was one of the keenest students of the group. The genus having its geographical center in California, the advantages of having available such an extensive and critically assembled representation from that region is apparent, especially so when it is realized that the collection was studied in conjunction with the large general collection, and very numerous types and historical specimens, contained in the Gray Herbarium. In combining the representations of the genus from the two herbaria mentioned over 1500 different specimens were made available for detailed study and comparison during the final review of the genus.

The detailed investigation resulting in this paper was carried on at the Gray Herbarium under the direction of Professor B. L. Robinson who has unstintingly given me of his time and scholarly aid. It is a pleasure here to express my gratitude for his friendly interest and encouragement, and ready aid in matters of perplexing nomenclature and difficult classification. I am also indebted to Professor W. A. Setchell of the University of California, who, in continuation of his many favors, has made it possible for me to restudy in detail the *Cryptantha* material from the University of California Herbarium. For assistance in bibliographic matters relating to this as well as other papers, I wish to express my indebtedness to the late Mary A. Day, Librarian at the Gray Herbarium, and to her successor, Miss Ruth D. Sanderson.

GENERAL DISCUSSION.

History of the Genus.

The generic name *Cryptantha* seemingly first appeared in a seed-list of the Hamburg Botanical Garden published in 1833 by Lehmann,[1] Del. Sem. Hort. Hamb. iv. The next appearance of the name was in a seed-catalogue from the gardens at St. Petersburg published in 1836 by Fischer & Meyer, Ind. Sem. Hort. Petrop. ii. 35. Two Chilean species, *C. glomerata* and *C. microcarpa*, were newly described, but no generic diagnosis was given. The third appearance of the name was in 1837 when these Chilean species appeared under a formal generic diagnosis in George Don's General System of Gardening and Botany, iv. 373. The effective publication of the generic name *Cryptantha*, therefore, dates from Don's General System, since in that work was fulfilled for the first time the requirement of a generic description called for in Art. 38 of the International Rules of Botanical Nomenclature.

The genus *Krynitzkia* was launched in 1841, being fully described in a seed-catalogue from the St. Petersburg gardens published by Fischer & Meyer, Ind. Sem. Hort. Petrop. vii. 52. The genus included a single Californian species, *K. leiocarpa*, transferred from

[1] This publication has not been examined, being apparently unrepresented in North American libraries. As Dr. J. H. Barnhardt has pointed out to me, however, no *Cryptantha* is listed among the six species reported on pages 4 and 5 of the Litteratur-Bericht zur Linnaea für das Jahr 1833 as having been briefly described by Lehmann in the seed-list mentioned, and it seems probable that if the name did appear in 1833, it was merely as a *nomen nudum*. The earliest reference associating the name *Cryptantha* with the Delectus Seminum of 1833 appears to have been that of De Candolle, Prodr. x. 129 (1846).

Echinospermum under which it had been described by the same authors in 1836.

The next important event in the history of the group occurred in 1846 with the appearance of the tenth volume of De Candolle's Prodromus. In this work *Krynitzkia* was kept up, although, except for a few poorly understood species given as doubtful members of *Lithospermum* or *Myosotis*, all species of *Cryptantha* then known were transferred, along with various species of *Plagiobothrys* and *Oreocarya*, to *Eritrichium* § *Cryptantha* (containing only the two original species) and *Eritrichium* § *Rutidocaryum*.

In 1871 Torrey's genus *Piptocalyx* was published by Watson, Bot. King Exped. 240 (1871). It was based upon *Lithospermum circumscissum*, a plant of western United States described by Hooker & Arnott in 1840.

A few years later Gray, Proc. Am. Acad. x. 58–61 (1874), published the results of his first study of the eritrichioid borages of western United States. Following De Candolle he referred all the species of *Cryptantha* to *Eritrichium*, and cited as synonyms of the latter *Plagiobothrys*, *Krynitzkia* and *Piptocalyx*. Gray's presentation of the group in the Synoptical Flora, ii. pt. 1, 193–197, in 1878 is essentially that of his paper in 1874.

In the year 1876 Bentham & Hooker published that part of their Genera Plantarum, ii. 850–851, treating the *Boraginaceae*. These authors, accepting the work of De Candolle and Gray, added still more diverse elements to the already overburdened genus *Eritrichium*. The species of *Cryptantha* were placed under that genus and considered generically indistinguishable from plants now classified under *Oreocarya*, *Plagiobothrys*, *Amblynotus*, *Megastoma*, *Anoplocaryum*, *Trigonotis* and *Eritrichium*.

The genus *Eritrichium* thus became so unwieldy and so obviously heterogeneous that its break-up was inevitable. The reaction began with Gray's notable paper in 1885, Proc. Am. Acad. xx. 257–286, in which the species of *Cryptantha* and *Piptocalyx* were placed under *Krynitzkia* along with species now referred to *Amblynotus*, *Oreocarya*, *Antiphytum* and *Plagiobothrys* § *Allocarya*. This treatment was repeated in the supplement of the second edition of the Synoptical Flora, ii. pt. 1, 423–430 (1886), published shortly before his death in 1888.

In a series of three papers published in 1887 by Greene, Pittonia i. 8–23, 55–60 and 107–120, the American representatives of De Candolle's overburdened *Eritrichium* were segregated in detail. First the

genus *Allocarya* was formed to cover the species Gray had treated as *Krynitzkia* § *Myosotidea*. Then *Piptocalyx* was resurrected, and two new genera, *Eremocarya* and *Oreocarya*, were founded, the first based upon the plant of southwestern United States described as *Eritrichium micranthum* by Torrey in 1859, and the second upon *Eritrichium* § *Pseudokrynitzkia* and part of *Krynitzkia* § *Pterygium* described by Gray in 1885. *Amblynotus* and *Antiphytum*, although not mentioned, were apparently also considered distinct from *Krynitzkia*. *Krynitzkia* having been finally trimmed to evident homogeneity, Greene, commenting cynically on Gray's reasons for accepting *Krynitzkia*, discarded the name and took up the earlier *Cryptantha*.

In 1899 *Piptocalyx* Torr. having been found to be a homonym of the valid name of an Australian monimiaceous shrub published in 1870, the substitute generic name *Greenocharis* was published by Gürke & Harms. In 1906 Grant, Bull. So. Calif. Acad. Sci. v. 28, proposed the name *Wheelerella* as a substitute for *Greenocharis*, since the latter name was said to have not met with Greene's approval. In 1923 both *Eremocarya* and *Piptocalyx* were reduced to *Cryptantha* by Johnston, Contr. Gray Herb. n. s. lxviii. 55–57.

The genus *Johnstonella* Brand, Fedde Repert. 1925 (as learned from proof sheets) is based upon *Eritrichium racemosum*, a Californian plant described by Watson in 1882.

In the present paper *Cryptantha* is taken as including *Krynitzkia*, *Piptocalyx*, *Eremocarya* and *Johnstonella*.

Gross Morphology.

Roots. All the North American species of *Cryptantha* are clearly annual. In most of the species the root is a slender herbaceous taproot obviously of short duration. In *C. racemosa* and *C. holoptera*, however, the taproot frequently becomes lignified to such a degree that the species have been repeatedly described as perennial. Nevertheless field observation has shown that these species are also annual. Professor E. C. Jeffrey has obligingly sectioned and examined material showing the maximum wood-development in *C. racemosa*. No growth-rings were discernable in a woody root about 9 mm. thick or in a section of stem nearly 5 mm. thick. Since the species grows in a desert area which is subjected to a sharply defined rainy and dry season it is more than probable that the plant is indeed annual, since even in such circumstances it lacks annual-rings though these are produced in such associated desert shrubs as *Ephedra*, etc.

A purple dye is secreted in the roots of some species, particularly so in *C. micrantha*. According to Norton, Rep. Mo. Bot. Gard. ix. 149 (1898), this is alkannin, a dye secreted by species belonging to various genera of the *Boraginaceae*. The presence of conspicuous amounts of alkannin in the roots of *C. micrantha* has been stressed as one reason for giving that species generic recognition (as *Eremocarya*). However, very noticeable amounts of alkannin are frequently produced in the roots of *C. Fendleri*, *C. Grayi*, *C. muricata*, *C. maritima*, etc., although this fact seems to have been generally overlooked. In most species there is scarcely any evidence of the production of this dye.

STEMS. The stems are usually slender and herbaceous, not infrequently somewhat fistulose. In *C. racemosa* the basal portion of the stem frequently becomes decidedly woody and almost 8 mm. thick. In this species, as well as in a number of others, the bark is frequently exfoliated in age. The common form of branching in the species of this genus is sparse, loose and ascending. Frequently, however, the branching becomes diffuse. Occasionally it is widely spreading, the branches becoming even subprostrate. Although the very lowermost branches are not uncommonly opposite, the middle and upper ones are more or less dichotomous. The dichotomy in *Cryptantha* varies much in the definiteness to which it is developed, although present in some degree in all the species. Strange to say, dichotomy has been considered a characteristic of *C. circumscissa* and *C. micrantha* and as characters of the segregate genera, *Greenocharis* and *Eremocarya*. The dichotomy of these species differs from that of indubitable members of *Cryptantha* neither in degree nor in nature. The ascendingly branched habit, rather characteristic of the genus, is absent in the common forms of *C. Fendleri* and *C. foliosa*, in which the stem is stiffly erect and forms a conspicuous axis.

LEAVES. The leaves are narrow and elongate, becoming linear, lanceolate or oblanceolate, and having acute to obtuse or very rarely retuse apices. Though commonly sessile the lowermost leaves are sometimes more or less narrowed into a petiole. The texture of the foliage is usually firm. The several basal pairs of leaves are unmistakably opposite with more or less short, sheathing, connate bases. Opposite lower leaves are produced by all the North American species of the genus, being obvious in the seedlings, although tending to be obscure in the mature plants. Despite this fact, *Cryptantha* has been repeatedly described as having consistently alternate leaves. Opposite leaves frequently persist in fruiting plants of *C. affinis*, *C. ros-*

tellata, etc. In some species, such as *C. maritima* and *C. circumscissa*, the leaves, especially the basal portion, become tessellated through the silicification of the epidermal cells. Usually, however, the leaves are at most somewhat abundantly pustulate.

TRICHOMES. The trichomes of *Cryptantha* are all simple, unicellular, and more or less siliceous. They differ in no striking way from the type of appendages occuring in most genera of the *Boraginaceae*, cf. Solereder, Syst. Anat. Dicot. ed. 2, i. 555–560 (1908). The siliceous hairs are either smooth and somewhat transparent, or are more or less roughened by encrustations and somewhat opaque. They are clear or more or less tawny in most species, but in *C. flaccida*, *C. simulans*, etc., they are noticeably pallid. Commonly the hairs are straight, but decidedly falcate and uncinate ones are developed on the calyx-lobes of *C. flaccida* and allies. The bristles vary notably in direction, length and rigidity, the common form being a stiff, long, slender one. Since this type of pubescence varies much in stiffness, two degrees of rigidity are distinguished under the names, "hispid" and "hirsute." The very stiff, somewhat pungent extreme, exemplified by the conspicuous hairs produced by typical *C. intermedia*, is termed "hirsute." The less rigid, more slender pubescence developed on the stems of such species as *C. Hendersoni* is termed "hispid." The trichomes are commonly spreading or somewhat appressed. Not infrequently, however, in such species as *C. flaccida*, *C. Clevelandi*, *C. dumetorum*, etc., the hairs are short and very closely strigose. More or less stiffish villous hairs are frequently developed, particularly on the calyx-lobes. This is best shown in *C. crinita* and *C. maritima*, var. *pilosa*. Subvillous hairs are occasionally found on the stems of some species, notably *C. pterocarya*. The bristles on the calyx-lobes are frequently quite stout. Probably the most decided extreme of this development is to be found in *C. foliosa*.

Associated with the bristle-like trichomes on the stem and leaves are the pale blistery structures called pustules. These are composed of a circle of slightly elevated, silicified, opaque, tessellately arranged epidermal cells surrounding the base of the trichome. They show much variety in size and frequency, varying from total absence to decided abundance, and up to a diameter of 1–3 mm. Similar structures are known in many European borage genera, cf. Revedin, N. Giorn. Bot. Ital. ser. 2, ix. 301–318 (1902). According to Solereder, l. c., the pustulate trichome-bases are cystolith-like in origin.

INFLORESCENCE. The flowers of *Cryptantha* are borne in two ranks in unilateral cymosely arranged spikes or racemes. Although funda-

mentally the spikes or racemes are disposed in a rhipidial cyme, this fact is often obscured by the complete reduction of the internodes within the inflorescence and consequent crowding of the spikes or racemes into fascicles terminating the branches. In species such as *C. micrantha, C. circumscissa, C. albida, C. Grayi, C. micromeres*, etc, the spikes are not at all fascicled, the cymose forking appearing to be indefinitely repeated and ending only at the death of the plant. With other species, of which *C. affinis, C. ambigua, C. echinella, C. mariposae, C. patula*, etc., are examples, the cymose forking is repeated only a very few times, perhaps only once. In all these cases the spikes or racemes are solitary or geminate, and not grouped into fascicles. The cymosely forking stem is terminated at any one time by a pair of spikes or racemes, and bears down its sides the solitary spikes which earlier were terminal. In such species as *C. muricata, C. flaccida, C. intermedia*, etc., by a complete suppression of the internodes separating the spikes, 3–6 of these have been crowded together to form a terminal fascicle. In *C. micrantha* scattered internodes are suppressed, this being shown by the opposite or subopposite bracts sprinkled through the inflorescence.

The racemes or spikes are loosely or somewhat densely flowered in age, but in *C. glomeriflora, C. leiocarpa, C. Torreyana* and *C. simulans* the flowers are frequently glomerate-congested. Most of the species have the spikes or racemes bractless or at most with 1 or 2 bracts occasionally subtending the lowermost flowers. In *C. albida, C. maritima, C. minima, C. micrantha, C. circumscissa*, etc., the spikes are leafy-bracted throughout or nearly so. Some forms exemplified by *C. ambigua, C. mariposae, C. crassisepala*, etc., have the peduncles of the spikes or racemes leafy, whereas others, such as *C. intermedia, C. pterocarya, C. microstachys*, etc., have even these naked. The rhachis of the spike is terete in all species except *C. dumetorum*, in which it is decidedly compressed and rather fragile.

Corolla. The corolla is white, and subtubular or more commonly short rotate-salverform. It may be very minute and inconspicuous, or become conspicuous and as much as 7 mm. broad. The tube always about equals the calyx-lobes and bears below the middle 5 stamens, the filaments of which about equal the length of the short-oblong included anthers. The throat is poorly developed, producing at the base 5 small intruded hemispherical or subtrapeziform appendages that occasionally almost close it. The lobes are variously developed, being either ovate-oblong or suborbicular, and either widely spreading or more or less strictly ascending. In the North American

species there are no cleistogamous flowers such as those developed in several groups of Chilean species.

Calyx. The calyx is usually much accrescent in fruit, *C. micromeres* being the species in which this is least so. Since the accrescent fruiting calyx is the most modified, in addition to being the most conspicuous, it alone is considered. Commonly it is divided to near the base, although in species such as *C. pusilla*, *C. sparsiflora* and *C. glomeriflora* it is less deeply so. In *C. circumscissa*, however, the calyx is obviously united to near the middle and in addition is unique in the genus in being circumscissile just below the sinuses. The fruiting calyx commonly shows more or less evident tendency towards irregularity or asymmetry. The mature calyces of such species as *C. albida*, *C. oxygona*, *C. pterocarya*, *C. holoptera*, *C. pusilla*, *C. micrantha*, etc., are regular or subregular. On the other hand the fruiting calyces of *C. dumetorum*, *C. flaccida*, *C. recurvata*, *C. echinosepala*, etc., are obviously asymmetrical. Commonly the irregularity is manifest in the slightly greater length and more conspicuous pubescence of the abaxial calyx-lobe. Less commonly, however, as in *C. recurvata* and *C. echinosepala*, it is the axial calyx-lobe that is the longest and most hispid or hirsute. Because it commonly very closely invests the nutlets, the mature calyx frequently becomes somewhat asymmetrical in consequence of the irregularities in shape or abortion of the nutlets. *Cryptantha dumetorum* has the calyx axially and downwardly gibbous, *C. affinis* has it compressed, *C. recurvata* has it obviously curved, and such species as *C. utahensis* or *C. flaccida* have it oblique or distorted. The base of the mature calyx may be rounded, conical or more or less angulate, and may be regular or oblique or evidently asymmetrical. In texture it is usually somewhat firmly herbaceous with the epidermis tending to become silicified. The calyces of *C. circumscissa* exhibit the extreme of this tendency towards silicification. The lobes of the mature calyces vary from narrowly ovate through lanceolate to linear. Though occasionally erect, they are commonly somewhat connivent above and have their tips spreading or even recurved. In pubescence the fruiting calyx shows various tendencies. The midrib, which is weakly developed in such species as *C. pterocarya*, *C. pusilla*, *C. circumscissa*, etc., and very strongly so in *C. crassisepala*, *C. intermedia*, etc., is commonly armed with evident bristles which vary in length, direction, slenderness and rigidity. The fructiferous calyx is usually ascending, but may be strictly and closely appressed to the rhachis as in *C. dumetorum*, *C. flaccida*, *C. microstachys*, etc., or spreading or deflexed as in *C. recurvata* or *C. echinosepala*.

The pedicel of the completely developed calyx is commonly very short or almost undeveloped. Although pedicels are lacking or practically absent in most species, evident and well developed ones are produced by *C. racemosa*, *C. holoptera* and *C. crinita*. Since the pedicels are clearly developed only in these three species they alone, in the present monograph, as treated as having "racemes." The remaining species, which have sessile calyces or very obscure pedicels, have been uniformly accredited with "spikes" although the unit of the inflorescence in some of the species might be more exactly described as "spicate-racemose" or "racemose-spicate." The preponderance of species have deciduous calyces. As already mentioned *C. circumscissa* has a circumscissile calyx. In this the lower cup-like portion is firmly attached and clearly persistent. Persistent calyces also occur in *C. micrantha* and *C. dumetorum*, and subpersistent ones are produced by *C. albida* and *C. racemosa*.

FRUIT.[1] The fruit of *Cryptantha* consists of 4 or fewer, elongate, ventrally grooved nutlets affixed to a usually elongate central gynobase. Most of the species have 4 ovules, but in *C. recurvata* and *C. maritima* only 2 are normally present. *Cryptantha maritima*, however, has an insular variety that is distinguished only by having 4 rather than 2 ovules. In shape the nutlets vary from broadly ovate or triangular-ovate to narrowly lanceolate. The back may be somewhat flattened, but is commonly more or less convex, although in *C. muricata* it is obtusish with a suggestion of a medial dorsal ridge. The sides of the nutlets in most species are clearly rounded or somewhat obtusely angled, but they may be quite acutely angled as in *C. mohavensis*, *C. angustifolia*, etc. In species like *C. utahensis*, *C. costata*, *C. racemosa*, etc., the margin is drawn out into a very narrow, thin, knife-like border. In other species the margin is greatly developed, wing-like, and about the width of the body of the nutlet. *Cryptantha holoptera* and *C. pterocarya* produce nutlets of this sort. In *C. pusilla* and frequently in *C. muricata*, the edges of the nutlets are thickened to form a bead-like margin. The surface of the nutlet may be smooth and shiny as in *C. Torreyana*, *C. leiocarpa*, *C. Fendleri*, etc., or may be variously roughened. In species such as *C. ambigua*, *C. simulans* and *C. Hendersoni* the roughenings consist of small, low, rounded bosses, a condition here described as tuberculate. Other species may have the nutlets studded with conical warts and thus become muricate, or with rather elongate nipple-like warts rendering

[1]The nutlets as well as all other minute structures have been consistently studied through a binocular dissecting microscope magnifying 38 diameters.

the surface papillate. Other species such as *C. muricata*, *C. intermedia*, *C. barbigera*, etc., have the surface of the nutlets verrucose, i. e. sprinkled with coarse simple warts. Species such as *C. crassisepala*, *C. echinella* and forms of *C. Hendersoni* have the nutlets covered with spinular papillae. On the roughened as well as the smooth nutlets the surface is frequently more or less covered with minute, white discules. Such nutlets have been traditionally but not very precisely described as granulate.

Although 4 ovules are commonly produced, one or more of them may fail to mature. Some species, it is true, characteristically mature 4 nutlets, but even in these one or more may be aborted. This abortion may prevail throughout the plant or be restricted largely to either its younger or older parts. This suggests that abortions may be partially connected with the nutrition of the plant as influenced by seasonal conditions. In other species, such as *C. flaccida*, *C. microstachys*, *C. texana*, etc., only a single nutlet is matured under normal conditions. This is either the axial or the abaxial one, its position being commonly characteristic of the species. In still other species, such as *C. Clevelandi* or *C. hispidissima*, the number of nutlets developed does not seem to be constant, 1–4 being matured, although, according to the species, the axial or abaxial nutlet is always developed. This tendency to individualize a particular one of the 4 nutlets seems to be more or less evident in all the species. It has been carried out in a conspicuous extreme in *C. crassisepala*, *C. maritima*, *C. dumetorum*, *C. micromeres*, etc., in which one nutlet is more firmly attached, larger than the others and often differently colored or roughened. In some species with homomorphous nutlets, such as *C. albida*, this tendency is revealed only by the greater persistence of some particular nutlet. A few species do not seem to show the tendency described. In *C. mohavensis* and *C. Watsoni* they seem to be almost perfectly homomorphous. In the specific group containing *C. ambigua* there appears to be no prevailing tendency towards individualizing a particular nutlet. In this respect the specific group is unique. The natural classification offered in this monograph is largely formed of groupings of species agreeing in the position (axial or abaxial) of the individualized or odd nutlet. Strange to say, it has been the current impression that heteromorphous nutlets were restricted to the specific group containing *C. crassisepala*, although, in fact, the condition is well developed in another specific groups, and, as already stated, its presence in the *C. crassisepala*-group is notable only because it has there an extreme expression.

The ventral groove of the nutlet may be open or closed (not fused) and may be simple or forked below. Some species, such as *C. Torreyana*, have the groove almost invariably closed, others, such as *C. Fendleri*, have it characteristically open, while still other species, such as *C. intermedia*, may have it open or closed. In *C. albida* the groove is very broadly dilated and becomes excavated. A similar condition is present in the consimilar nutlets of *C. crassisepala* and *C. minima*. The groove of *C. costata* is open, but is extremely shallow. In *C. flaccida* the groove is not only closed, but frequently has one margin overlapping the other. The groove of *C. leiocarpa* is closed and not forked or is very obscurely so at the very base. In *C. ambigua*, *C. Torreyana*, etc., it is very broadly forked below. In most species there is a small open areola formed at the forking. The groove on the more or less asymmetrical nutlets of *C. affinis* and *C. glomeriflora* is evidently excentric and dilated below into an irregular triangular areola.

The gynobase varies from quadrangular-subulate to narrowly pyramidal or very shortly columnar. Usually it is subulate as in *C. intermedia*, *C. leiocarpa*, *C. Fendleri*, *C. pterocarya*, etc. The narrowly pyramidal form is produced by *C. albida*, *C. pusilla*, etc. In species such as *C. texana*, *C. glomeriflora*, *C. microstachys*, the gynobase is reduced to an inconspicuous, exceptionally short column. It commonly reaches to about ⅔ the height of the nutlets, though frequently in such species as *C. Grayi*, *C. costata*, *C. holoptera*, etc., it reaches to the summit of the nutlets, or in species such as *C. glomeriflora* and *C. microstachys* only to about ¼ the height of the latter. Commonly the style is sharply differentiated from the gynobase. In *C. micrantha*, however, the style is not clearly set off and appears to be the subulate prolongation of the gynobase. In the length of the style and the height to which it reaches on the nutlets, the species noticeably vary. Generally the style reaches to $^{2}/_{3}$–$^{4}/_{5}$ the height of the nutlets, but it may just reach the tips of the nutlets or even surpass them. In species such as *C. glomeriflora* and *C. flaccida* the style reaches less than $^{1}/_{3}$ the height of the nutlets.

Abnormalities. In Southern California and less commonly in the deserts of Nevada and Utah, the plants of *Cryptantha* frequently become fasciated. All or only some of the stems are affected. The abnormal stems are short and for the most part unevenly reddish-tinged, and are clothed with strictly ascending, scarcely reduced leaves. The spikes are usually undeveloped, or are partially developed and form a glomerate infertile mass above. The affected plant as a

whole is very dense and broom-like. Although clearly abnormal the cause of this condition has not been ascertained. *Cryptantha* has been reported as host for *Puccinia ryptanthes* Diet. & Holw., *P. submitens* Diet. and *Synchitrium myosotidis* Kühn., but none of these fungi causes such abnormal growth. A microscopic examination has failed to disclose any other fungi affecting the plant, nor any mites, aphids or similar parasites capable of profoundly disturbing it. The condition described has been noted in *C. intermedia*, *C. barbigera*, *C. simulans*, *C. angustifolia*, *C. gracilis*, and *C. pterocarya*, although it appears to be most common in the species first mentioned.

Systematic Position of the Tribe Eritrichieae.

Cryptantha is obviously a member of the *Eritrichieae* and appears to have been derived from the closely related, and also West American genus, *Oreocarya*. It is believed that this genus was evolved from the *Lithospermeae* through some forms similar to the North American species of *Antiphytum*. These opinions assume the correctness of the arrangement of the tribes of the *Boraginaceae* given in a recent paper by Johnston, Contr. Gray Herb. n. s. lxxiii. 42 (1924). Since the assumption there expressed, that the *Cynoglosseae* are derived from the *Lithospermeae*, is directly contrary to that accepted in standard works, it seems well to state the reasons for this belief so that the direction of evolution may be understood and phylogenetic speculations regarding *Cryptantha* logically founded.

Brand, Pflanzenr. iv. Fam. 252, pt. 1, 14 (1921), agreeing with previous authors, considers the *Cynoglosseae* among the *Boraginoideae* to be most nearly related to the *Heliotropioideae*, saying "Der endständige Griffel, das Charakteristikum der *Cordioideae*, *Ehretioideae* und *Heliotropioideae* findet sich bei den *Borraginoideae* in 2 Gattungen, *Trichodesma* und *Lacaitaea*, wenigstens zur Blütezeit. Diese beiden Gattungen müssen daher an der Spitze der *Cynoglosseae* stehen, ..." However, *Trichodesma* and *Lacaitaea* clearly have pyramidal gynobases, their appendaged nutlets are attached supramedially and have free bases. These developments represent considerable departure from the *Heliotropioideae* and very much greater departure than the common developments produced by the *Lithospermeae*. This may be appreciated after consideration of the following data.

The *Boraginaceae* appear to have sprung from ancestors with two, (at least) biovulate carpels. This is suggested by the occurrence in many of the shrubby genera of the *Heliotropioideae* and *Ehretioideae*

of fruit which is 2-celled, is more or less incompletely 4-celled, or has decidedly paired carpels, cf. Miers, Contr. Bot. ii. 190–261 (1869), and further suggested by stages in the development of the fruit in various members of the family, cf. Baill. Adansonia iii. 1–7, t. 1 (1862); Rosanoff, Jahrb. Wiss. Bot. v. 72–80, t. 5–6 (1866) and Payer, Organ. Vég. 546–549, t. 112 (1857). At an early stage in the development medial partitions form which divide each of the two carpels so that at maturity the fruit becomes virtually 4-carpellate.

The primitive fruit was probably similar to that of the *Hydrophyllaceae*, being 2- or imperfectly 4-celled, capsular, and terminated by a lobed style. The lobed style consistently occurs in those tribes of the *Boraginaceae* which are commonly considered primitive, i. e. the *Heliotropioideae*, *Ehretioideae* and *Cordioideae*. Within the *Boraginoideae* the style is lobed or bears geminate stigmas only in the *Lithospermeae*. Within in the subfamily it is borne on a flat receptacle or more commonly on an elevated gynobase. In the more primitive subfamilies the style is seated in the pericarp, usually at the tip of the more or less globular, 2–4-celled fruit. There is no thickened, persistent gynobasic column connecting the style directly with the receptacle, the style being seated in pericarpial tissue and falling away with some one of the carpels when the fruit breaks up. This condition prevails in the *Heliotropioideae* and *Ehretioideae*, and is completely and fundamentally different from that in the *Cynoglosseae* and in *Trichodesma* or *Lacaitaea* in particular.

The nutlets have resulted from a pinching in of the pericarpial walls to form lobes of the fruit each containing one carpel. The stages of this development may be appreciated by a comparative study of the fruit of *Heliotropium* or, better still, *Coldenia*. *Coldenia canescens*, T. & G. Pacif. R. R. Rep. ii. pt. 2, 169, t. 7 (1856), has an unlobed fruit bearing a decidedly terminal style. *Coldenia Nuttallii*, Torr. Bot. Wilkes Exped. 410, t. 12 (1874), or *C. hirsutissima*, T. & G. l. c. 170, t. 9, has the lobing evident and the style attached to the pericarp between and below the apices of the nutlets. In *C. litoralis* the lobing is almost complete and the style is affixed practically upon the receptacle. From a study of this, and similar series, it seems clear that the development of the nutlets has proceeded by the deepening downward from the apex, and inward from the sides, of the pinching in of the pericarp between the carpels. This finally results in an obviously basal attachment of the nutlets, and the gradual lowering of the style-base between the nutlets until it is at last directly and firmly affixed upon the receptacle. The gynobase appears to be sub-

sequently developed, either by the thickening of the style-base, or by the pushing up of the central portion of the receptacle.

It seems clear that the *Cynoglosseae* are not the primitive members of the subfamily *Boraginoideae*, for the nutlets are not attached basally, but apically or subapically, and, except in such anomalous genera as *Harpagonella*, *Antiotrema* and *Bothriospermum* in which the nutlets are completely inverted and attached by the (morphological) tip to a flattened gynobase, the gynobase is obviously developed. A study of the stages in the history of nutlet-development in the *Heliotropioideae* and *Ehretioideae* is conclusive in showing that the base of the fruit-lobe, in these unspecialized groups, is never free when the apex is not, although the contrary condition is of common occurrence. The nutlets being basally attached and the gynobase commonly flat in the *Lithospermeae* it seems quite obvious that the group is indeed the most primitive one of the *Boraginoideae* and hence closest to the *Heliotropioideae*. Significant in this regard, is the fact that the heliotropioid stigma is suggested in certain species of *Lithospermum*. The stigma in this genus occasionally becomes somewhat lateral with the style-branches prolonged beyond them. Rarely the lobes become more or less fused and the stigmas, brought near one another, tend to cohere just as illustrated by Reichenbach, Icon. Fl. Germ. xviii. t. 113 (1858). The result is a stigma differing in no profound way from that characteristic of the *Heliotropioideae*. The primitive subfamilies being prevailingly woody it is also significant that within the *Boraginoideae* the most decided tendency towards woodiness is found in the *Lithospermeae*.

Not only do the *Cynoglosseae* lack certain features suggesting close relationship in the *Heliotropioideae*, but they have developments which make such an affinity seem improbable. As previously mentioned, the style is gynobasic and though appearing to be terminal in *Trichodesma* is not really so. A careful examination of *Trichodesma* shows clearly that the style is not attached at the apex of the fruit and seated in pericarpial tissue, as in *Heliotropium* for example, but is definitely borne at the apex of a well developed gynobase. The nutlets are covered with highly specialized appendages which suggest nothing in the *Heliotropioideae* or *Ehretioideae*, although the development of these appendages can be traced back into the immediately related tribe *Eritrichieae*, from which the *Cynoglosseae* seem in fact to have evolved. The apical nutlet-attachment of the *Cynoglosseae* is wholly unlike any development in the less specialized subfamilies, but is obviously the termination of a strong tendency towards

elevation of the nutlet-attachment which is discernable in the *Lithospermeae* and quite evident in the *Eritrichieae*.

The *Lithospermeae* being thus considered the most primitive tribe of the *Boraginoideae* because of its basifixed unappendaged nutlets, non-gynobasic usually lobed style or double stigmas, unspecialized corollas, and frequent development of woody habit, it now becomes a relatively simple matter to place the tribe *Eritrichieae*. The *Lithospermeae* appear to have evolved from some primitive member of the *Heliotropioideae* or specialized member of the *Ehretioideae*. The tribe appears to have given rise to two principal evolutionary lines. On one hand to the relatively unimportant line represented by the *Anchuseae*, in which the nutlet-attachment has tended to become conspicuously margined and the attachment-surface on the nutlet tended to become elevated into a strophiolate plug. On the other hand it has evolved into a major line of development which ends in the *Cynoglosseae*, the most specialized group in the entire family. This latter evolutionary line is characterized by a tendency of the nutlet-attachment to move from the chalaza-end of the nutlet towards the radicle-end, i. e. from base to apex, and for the nutlets to vary from rounded and smoothish towards margined and variously roughened and appendaged. The *Eritrichieae* form a rather arbitrary group including the medium developments on the latter line. The tribe is usually regarded as including the genera in which the nutlet-attachment is typically lateral. The nutlets may be smooth or roughened or appendaged, margined or unmargined. The other characters indicative of the *Eritrichieae* have been already outlined in another paper, Contr. Gray Herb. n. s. lxxiii. 57 (1924), and need not be repeated here.

Generic Relations.

As previously stated, *Cryptantha* is obviously a member of the tribe *Eritrichieae* and is apparently derived from the very closely related genus *Oreocarya*. Among their immediate relatives, *Oreocarya* and *Cryptantha* are together characterized by the possession of a medial ventral groove on the nutlets, this formed by the non-fusion of the pericarpial walls. This development appears to have been brought about by the gradual encroachment of the pericarp over the surface of a sharply cut triangular attachment-scar such as those present in the *Lithospermeae*. This encroachment gradually narrows the attachment-surface of the nutlet and forms a groove which is usually somewhat forked at the base. In *Cryptantha* and *Oreocarya* the groove

is narrow, but not completely closed. In *Amsinckia*, *Plagiobothrys*, etc., the forked groove is entirely shut and its location is marked by a ridge of fused, pericarpial tissue which bears the caruncular scar, or small modified areola at the forking below the middle of the nutlet.

It seems quite likely that *Oreocarya* has been derived from some form of *Antiphytum*, a genus of the *Lithospermeae* evidently derived from *Lithospermum*. Such a species as *A. peninsulare* not only has a habit suggestive of *Oreocarya* and related genera, but has nutlets, which, except in the nature of the attachment, are remarkably like those of some species of *Oreocarya* and *Plagiobothrys*. Its rather large attachment surface is lateral and submedial, but is otherwise like the attachment-surface of most *Lithospermeae*. The encroachment of the pericarp over the scar of *A. peninsulare* would result in a nutlet remarkably like that of *Oreocarya* or *Plagiobothrys;* the particular similarity depending on the extent to which the encroachment proceeded. It is to be noted, however, that *Antiphytum* has a style bearing geminate stigmas, whereas *Oreocarya*, *Plagiobothrys*, *Cryptantha*, etc., all have solitary stigmas. Inasmuch as the stigmas of *Antiphytum* are less obvious than are those of *Lithospermum*, its progenitor, it is not hard to suppose that this tendency was carried to an extreme and the geminate stigmas became coalescent in the progenitor of *Oreocarya*.

Cryptantha is a specialized off-shoot from *Oreocarya*. The latter genus consists of rather coarse perennials, or rarely biennials, with persistent fructiferous calyces and homomorphous nutlets. In *Cryptantha* a successful, annual, herbaceous habit has been evolved, in addition to more or less deciduous fruiting calyces and somewhat heteromorphous nutlets. By taking on the annual habit, and developing detachable somewhat bur-like fruiting calyces, *Cryptantha* has been able to reproduce, spread and evolve very rapidly, adapting itself to the variety of conditions in western America and greatly surpassing *Oreocarya* both in number and in the variability of its species.

Oreocarya seems to have also given rise to *Plagiobothrys*, a group which seems to have evolved into *Amsinckia*, and into a line producing *Microula*, *Craniospermum*, etc. The principal derivative of *Oreocarya*, however, appears to be *Hackelia*, for through that genus *Oreocarya* appears to connect with *Cynoglossum* and the tribe *Cynoglosseae*.

While the medial ventral groove on the nutlets of *Oreocarya* and *Cryptantha* characterize these genera among their immediate relatives, the development is by no means peculiar to them. It is present in *Microcaryum*, *Amblynotus* and *Megastoma*, and slightly developed in *Oreogenia* and *Chiomocharis*. *Microcaryum*, *Oreogenia* and *Chiono-*

charis appear to be Asiatic developments from the plexus containing *Plagiobothrys*. The immediate relations of *Amblynotus* are wholly obscure. *Megastoma*, although remarkably simulating *Cryptantha*, cf. Bonnet & Barratte, Ill. Phaner. Tunis t. 11 (1895), and having been accepted as a close relative of the genus by all authors including the writer, Contr. Gray Herb. n. s. lxxiii. 64 (1924), appears in fact to be of the *Lithospermeae* and to be most closely related to *Echiochilon*. The detailed study of specimens, recently at hand, shows the stigma to be decidedly geminate, and the yellowish unappendaged corollas to be slightly irregular and to bear the stamens at slightly unequal heights. *Megastoma* is immediately related to *Echiochilon*, agreeing with it in its irregular calyx and corolla, but differs from it in its broadly grooved nutlets, large gynobase, glabrous and much less irregular corolla and almost equally inserted stamens. *Echiochilon* is practically an African genus, and the affinities just mentioned with *Megastoma*, a plant of the deserts of Algeria and Tunis, seem thoroughly satisfactory on phytogeographical grounds, and vastly more so than the supposed relations between *Megastoma* and *Cryptantha*.

Generic Concept.

As here taken the genus *Cryptantha* includes *Krynitzkia*, *Piptocalyx*, *Eremocarya* and *Johnstonella*. Since two of these genera have achieved some currency in botanical literature it seems well to review the claims which these rejected genera have for recognition.

Since the resurrection of *Cryptantha* by Greene in 1887, *Krynitzkia* has been almost universally regarded as a clear synonym of the earlier genus. *Krynitzkia*, in fact, appears to have been deliberately maintained only by Katherine Brandegee and Prof. M. E. Jones. Mrs. Brandegee, I have been told, was not satisfied that the cleistogamous Chilean species, i. e. the true species of *Cryptantha*, were actually congeneric with the more abundant open-flowered species which form the bulk of the genus in South America and the entire representation of it in North America. Being in doubt as to the applicability of the earlier name, *Cryptantha*, she was content to follow Gray in accepting the name *Krynitzkia*, since there could be no uncertainty regarding the applicability of it to the North American plants. Similar reasons, as well as his confidence in Gray's judgment, seem to have given Jones the basis for his persistent use of *Krynitzkia* in the broad interpretation of Gray.

The two original species of *Cryptantha* and several other closely

related ones depart from the common phases of the genus in no striking development other than the presence in the inflorescence of more or less numerous cleistogamous flowers. As these commonly occur variously mixed with open flowers, and since they are borne on plants which in gross habit and inflorescence, as well as in details of fruit and calyx, are quite like the completely normal-flowered plants, there seems to be no reason why we should differ from Reiche, Fl. Chile v. 217–237 (1910), who has studied the Chilean species, and consider the name *Cryptantha* applicable only to the few Chilean species bearing cleistogamous flowers in the inflorescence. Especially is this the case when it is remembered that another and more peculiar phase of cleistogamy, in such species as *C. phaceloides* and *C. linearis*, goes completely unrecognized.

Of the four genera reduced under *Cryptantha*, *Piptocalyx* is the most notable. Under the name *Piptocalyx* or *Greenecharis* this portion of the genus has gained rather wide generic recognition following its reinstatement by Greene in 1884. Previously, however, it had been usually treated as a section under *Eritrichium* and later under *Krynitzkia*. In 1921 Johnston gave it sectional rank under *Cryptantha*. The outstanding development of *Piptocalyx* is its persistent circumscissile calyx. In flowers, fruiting structures, as well as inflorescence and branching, it differs in no fundamental way from the *Cryptantha* species related to *C. angustifolia*. In fact, its gross habit is such that it was once described as a species of *Cryptantha* by A. Nelson. Greene, in resurrecting the genus, made much of the dichotomy of *Piptocalyx*, although the cymose branching is decidedly similar, if not exactly the same as that developed in *C. Grayi*, *C. angustifolia*, etc. Rather than showing a profound difference, like the fruiting structures, the cymose branching suggests a very close affinity between *Piptocalyx* and *C. micrantha*, *C. Grayi* and *C. angustifolia*. The character of branching failing to separate *Cryptantha* and *Piptocalyx* the latter must, perforce, stand or fall according to the emphasis placed on its peculiar calycine developments. It is to be noted that the possible generic characters of *Piptocalyx*, the circumscissile fission of the calyx and the persistence of the cupulate calyx-base, merely represent phases of a single aberrant structure. For this reason it has been considered unwise to separate the plant from its obviously close affinities in *Cryptantha*. Furthermore, species with circumscissile calyces and those without are universally admitted to the closely related genus *Plagiobothrys*, and in addition the degree to which the calyces are persistent in *Cryptantha* is variable, they being

readily deciduous, or persistent or subpersistent as in *C. albida*, *C. racemosa*, *C. dumetorum*, *C. micrantha*, etc.

Eremocarya, like *Piptocalyx*, has achieved wide recognition since its publication in 1887. Unfortunately it appears to lack characters of generic value. Greene, who launched the genus, laid much emphasis upon its spikes, which were described by him as "biserial and very dense, conspicuously leafy-bracted, and repeatedly forked." Except for the bracts and the complete lack of reduced internodes, the inflorescence and branching of *C. angustifolia* and *C. Grayi* are exactly similar to those of *Eremocarya*. More or less similar biserial, leafy-bracted and repeatedly forked cymes are to be found in such species as *C. circumscissa*, *C. albida*, *C. maritima*, etc. It can be decisively said that *Eremocarya* can not be separated from *Cryptantha* by any character of inflorescence.

The calyx of *Eremocarya* is said to differ from that of *Cryptantha* in its persistence. However, calyces as persistent as those of *Eremocarya* occur in *C. dumetorum*, a species no one has attempted to exclude from *Cryptantha*. The style in *Eremocarya* is scarcely distinguishable from the gynobase proper. This thickened style, appearing as a continuation of the gynobase, much surpasses the nutlets and bears the stigma almost at the level of the tips of the calyx-lobes. Similarly elongate and persistent styles are developed in *C. racemosa*. The thickness of the style, therefore, appears to be the only peculiar character of *Eremocarya*. This is not considered of generic value.

The genus *Johnstonella* is being proposed by Brand to include certain species thought to be generically ambiguous. *Cryptantha racemosa*, the type species, is said to have persistent calyces, thereby exhibiting a salient character of *Oreocarya*. In habit the plant is clearly a *Cryptantha*. It seems to be of particular note only because of its more or less suffrutescent character. In duration, however, it is unquestionably annual. Furthermore it can be definitely said to have deciduous calyces. There are at least twenty collections in the Gray Herbarium and University of California Herbarium which exhibit completely or partially denuded raceme-rhachises. The calyces are no more persistent than are those of *C. holoptera* or *C. albida*, and not so decidedly so as are those of *C. dumetorum*. The genus is clearly synonymous.

Expanding the limits of *Cryptantha* to include the four genera just discussed we dispose of several small or monotypic genera, and obtain a very naturally defined and readily recognized genus. This covers more or less stiffly haired, rather slender annual herbs which agree

in having more or less distinctly biserial spikes or racemes of white flowers and later somewhat irregular deeply lobed hairy calyces, and which develop 1–4 somewhat heteromorphous nutlets that are attached laterally to an erect gynobase through a medial ventral groove. As a group it inhabits sunny open places, in North America ranging from southern Alaska to southern Mexico, although it is most common in western United States, and particularly so in California. It is to be confused only with *Oreocarya* and *Plagiobothrys*. From the former, its closest relation, it differs in its slender annual, rather than coarse biennial or perennial habit, and commonly deciduous, rather than invariably persistent calyces. From *Plagiobothrys* (including *Allocarya* and *Somnea*) it differs in having the nutlets attached through a ventral groove, rather than through a caruncular scar or along the crest of the ventral keel.

The Species.

Fifty-seven species, two of which are new, are here recognized as occurring in North America. This is approximately half the total number of species, the genus having a similar development in Chile, Argentina and Peru. In North America most of the species occur in California, forty-five being known from that state alone. The genus, however, is not infrequent over most of western United States. One species, *C. Torreyana*, ranges northward to southern Alaska and another, *C. albida*, occurs as far south as southern Mexico. The most easterly ranging species are *C. minima*, which reaches central Nebraska, and *C. texana*, which reaches east-central Texas. Most of the species grow in warm, open, gravelly or sandy places, particularly on the desert, others occur on dry, sunny, open flats in the pine-belt of the mountains and still others grow on open, grassy slopes or in clearings or burns in chaparral. The plants have no conspicuous place in the vegetational succession of the region, being secondary herbs commonly forming vernal or estival colonies in the earlier stages of the succession.

The describers of the oldest species made much of the shape and appendages of the corolla. With the increase of material the relative uniformity of the corolla-structures became apparent, and the attention, after having first been laid on the mere presence or absence of roughenings on the nutlets, was finally focused on the character of the nutlet-groove. Much of the confusion that has obscured the species of this genus is directly traceable to the persistent and ex-

cessive emphasis which has long been laid on this character. The groove of the nutlet shows much more intraspecific variation than has been realized. While decidedly valuable in recognizing certain species, it is after all a character of only secondary importance, and, like every other character in this genus, is subject to decided and frequently erratic variations. It is obvious that the character is only to be used in conjunction with others.

The most important specific characters are certain fruit-developments. Among the most valuable of these are the extent and nature of the individualization of the axial or abaxial nutlet, the number, size, shape and surface of the nutlets, the nature of the nutlet-groove, the shape and height of the gynobase, and the height reached (in relation to the nutlet-length) by the style. The size of the corolla is frequently significant, as is also the size, shape, direction and depth of lobing of the fruiting calyx, and the shape, direction and pubescence of the mature calyx-lobes. The arrangement of the spikes or racemes, as well as the presence or absence of bracts, is important. So also is the character of the pubescence.

The excessive variability of the characters of *Cryptantha* does not seem to have been fully appreciated. Particularly confusing in this genus is its propensity for unexpected, erratic variation in a single character or group of related characters. This is probably due to the fact that the species have a short life-cycle and are in active evolution. As a result the worker in this group is constantly confronted with much aberrant material. It is frequently necessary, therefore, to admit as atypical phases of a given species many specimens whose mass of characteristics indicate the accepted relation, even though the atypical character be a favorite one and perhaps that emphasized in the key. To attempt to name these atypical forms seems thoroughly unwise, since they are endless, and commonly represent odd plants or extremely localized phases, or, as seems likely, intraspecific hybrids.

Some of the species admitted completely intergrade. In most cases these species occupy adjacent floral districts, and the intergradation is confined to a definite region lying between them, being thus in all probability of hybrid origin. In any case it seems best to maintain certain intergrading groups as specific, since to insist upon absolute non-intergradation as a criterion of specific difference would result in extensive reductions and give a condition as unsatisfactory as would extensive segregation. The groups treated as species, however, can be readily recognized after a little study and appear to be eminently natural, having a characteristic gross aspect and credible ranges.

SYSTEMATIC ACCOUNT.

Generic Characters.

Cryptantha Lehm. Calyx lobed to below middle or more commonly almost to base, accrescent in fruit, usually deciduous; lobes linear to lanceolate or rarely lance-ovate, erect or connivent above in fruit, often slightly unequal; pedicels erect to widely spreading, commonly very poorly developed. Corolla white, minute to evident, regular, glabrous; tube cylindrical, equalling calyx-lobes or surpassed by them; throat saucer-shaped or somewhat funnel-form, more or less closed below with 5 semicircular or subtrapeziform intruded appendages; lobes 5, imbricate, orbicular to obovate-oblong, spreading or occasionally somewhat erect. Stamens 5, included; filaments short, equally inserted below the middle of the corolla-tube; anthers short-oblong, about as long as the filaments. Ovules 4 or rarely 2, amphitropous. Nutlets 1–4, straight, usually vertical, ovate to lanceolate, affixed laterally through an elongate medial ventral groove to a pyramidal or subulate erect gynobase, unmargined or with more or less well developed marginal wing, smooth or somewhat warted or spiculiferous, neither rugose nor keeled, usually deciduous, tending to be heteromorphous. Seeds ascending, vertical, chalaza-end lowermost. Cotyledons flat, broad, undivided. Style included in the corolla-tube at anthesis, surpassing the tips of the mature nutlets or greatly surpassed by them, bearing a distinctly solitary simple terminal stigma.—West American annual herbs with stiffish pubescence. Leaves linear to lanceolate or spatulate, elongate, several lower pairs always opposite, the upper ones alternate. Flowers in bracted or naked fasciculate or cymosely disposed spikes or racemes.

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Artificial Key to Species.

Nutlets with margins decidedly winged or knife-like.
  Pedicels usually evident, slender, 1–4 mm. long.
    Nutlets homomorphous.....1. *C. holoptera.*
    Nutlets decidedly heteromorphous.....2. *C. racemosa.*
  Pedicels obscure or none, less than 1 mm. long.
    Nutlets heteromorphous, the odd nutlet abaxial.
      Fruiting calyx ca. 2 mm. long; nutlets 0.6–0.7 mm. long...3. *C. angelica.*
      Fruiting calyx 2.5–3 mm. long; nutlets ca. 1.7 mm. long..4. *C. inaequata.*
    Nutlets homomorphous or if slightly heteromorphous the odd nutlet axial.
      Nutlets lucid, somewhat bent, margin thickish; gynobase narrowly pyramidal.....5. *C. pusilla.*
      Nutlets dullish, straight, margin thin; gynobase subulate.
        Nutlets very obscurely roughened, decidedly plano-convex in cross-section (the back rounded and the face flat).....6. *C. costata.*
        Nutlets tuberculate or muricate, not noticeably plano-convex in cross-section.
          Nutlets solitary or rarely 2; calyx obliquely conical at base.....17. *C. utahensis.*
          Nutlets 4, calyx symmetrical.
            Corolla conspicuous; mature calyx obviously longer than broad.....18. *C. oxygona.*

Corolla inconspicuous; mature calyx usually almost as broad as long. . . . . 19. *C. pterocarya.*

Nutlets with margins rounded or angled, never with marginal wing or knife-like edge.

Nutlets all smooth.

Hairs on calyx uncinate or decidedly arcuate.

Style reaching 1/2–2/3 height of nutlet, this with an open areola. . . . . 53. *C. rostellata*

Style reaching less than 1/2 height of nutlet; groove of nutlet closed.

Nutlets nearly terete, rostrate; hairs on calyx usually encrusted and pale. . . . . 54. *C. flaccida.*

Nutlets decidedly compressed, acute; hairs on calyx smoothish and less pale. . . . . 55. *C. sparsiflora.*

Hairs on calyx straight.

Nutlet with excentric groove.

Nutlets 1; flowers axillary, not biserial. . . . . 57. *C. glomeriflora.*

Nutlets 4; flowers in biserial naked spikes. . . . . 56. *C. affinis.*

Nutlet with a centrally placed groove.

Spikes bracteate.

Style reaching or a little surpassing the nutlet-tips; nutlets ovate, groove usually simple or nearly so. . . . . 46. *C. leiocarpa.*

Style reaching 2/3–3/4 height of nutlets; nutlets oblong-ovate to lanceolate, groove usually broad-forked.

Stems reddish; nutlets 1, axial. . . . . 16. *C. maritima.*

Stems green; nutlets 1–4, abaxial when solitary.

Corolla less than 1 mm. broad; diffuse prostrate plants. . . . . 51. *C. Brandegei.*

Corolla 1.5–2 mm. broad; sparsely branched erect plants. . . . . 52. *C. Abramsii.*

Spikes naked or with a few bracts at base.

Nutlets broadly ovate.

Corolla conspicuous, 4–7 mm. broad; spikes commonly ternate. . . . . 36. *C. Hendersoni.*

Corolla inconspicuous, 1–2 mm. broad; spikes usually solitary or geminate.

Spikes usually geminate; inflorescence projected above the leafy mass of plant, well defined. 38. *C. Torreyana.*

Spikes usually solitary, not sharply differentiated from the leafy peduncular stems.

Nutlets homomorphous; Montana and Colorado westward. . . . . 40. *C. ambigua.*

Nutlets slightly heteromorphous; Colorado and Wyoming. . . . . 20. *C. Pattersoni.*

Nutlets oblong-ovate to lanceolate.

Style reaching 1/4–3/4 height of nutlets, these 1–4.

Calyx densely appressed hispid-villous, commonly lacking conspicuous spreading bristles; desert interior. . . . . 44. *C. gracilis.*

Calyx sparsely hispid-strigose and evidently spreading-hirsute; coastal slopes of California.

Hairs on upper part of calyx-lobes conspicuously retrorse. . . . . 49. *C. nemaclada.*

Hairs on upper part of calyx-lobes spreading or ascending.
Style reaching to 2/3–3/4 height of nutlets.
50. *C. Clevelandi.*
Style reaching to 1/4–1/2 height of nutlets.
48. *C. microstachys.*
Style almost reaching the nutlet-tips or surpassing them.
Margin of nutlets acute, at least above the middle.
Corolla conspicuous; style clearly surpassing nutlets, these 2–2.5 mm. long.....42. *C. mohavensis.*
Corolla inconspicuous; style reaching to the nutlet-tips or a trifle surpassed by them; nutlets 1.2–2 mm. long.....43. *C. Watsoni.*
Margin of nutlets rounded or obtuse.
Groove of nutlet opened below into a triangular areola; plants usually with a definite central axis; not Californian..45. *C. Fendleri.*
Groove of nutlet closed throughout; plants irregularly branched; Californian..47. *C. hispidissima.*
Nutlets all rough or at least some of them so.
Nutlets decidedly heteromorphous.
Mature calyces strongly appressed to the flattened rachis; decidedly gibbous on axial side, persistent....14. *C. dumetorum.*
Mature calyces somewhat spreading, nor at all gibbous.
Fruiting calyces widely spreading or reflexed, most hirsute on axial side.....13. *C. echinosepala.*
Fruiting calyces ascending, most hirsute on abaxial side.
Odd nutlet abaxial, surpassed by style.
Spikes bracteate throughout; calyx persistent. 7. *C. micrantha.*
Spikes naked or nearly so; calyx deciduous.
Pedicels slender, 1–4 mm. long.....2. *C. racemosa.*
Pedicels stout and obscure, less than 1 mm. long.
Nutlets 0.6–0.7 mm. long.....3. *C. angelica.*
Nutlets 1–1.7 mm. long.
Nutlets 1.3–1.7 mm. long; calyx 2–3 mm. long.....4. *C. inaequata.*
Nutlets ca. 1 mm. long; calyx 3–4 mm. long.....8. *C. angustifolia.*
Odd nutlet axial; style surpassed or occasionally reachng to the nutlet-tips.
Nutlets small 0.7–0.9 mm. long, triangular-ovate.
15. *C. micromeres.*
Nutlets larger, 1–2.3 mm. long, ovate to lanceolate.
Odd nutlet smooth and shiny.....16. *C. maritima.*
Odd nutlet tuberculate or papillate.
Spikes bracteate.....23. *C. minima.*
Spikes naked.
Odd nutlet spinular-muricate; calyx-lobes conspicuously thickened.....24. *C. crassisepala.*
Odd nutlet more or less granulate; calyx-lobes moderately thickened.
Nutlets ovate, smoothish or sparsely tuberculate, odd one ca. 1.9 mm. long.....20. *C. Pattersoni.*

Nutlets lanceolate or narrowly ovate, coarsely tuberculate, odd one 2–2.6 mm. long.....22. *C. Kelseyana.*
Nutlets homomorphous or practically so.
Calyx circumscissile.....10. *C. circumscissa.*
Calyx not circumscissile.
Style surpassing the nutlets.
Spikes bracted throughout.
Groove of nutlet broadly dilated to form a triangular areola occupying much of the ventral side of nutlet: gynobase narrowly pyramidal..11. *C. albida.*
Groove of nutlet narrow, scarcely dilated below; gynobase subulate.....7. *C. micrantha.*
Spikes sparingly if at all bracted.
Nutlets bent, lucid; gynobase narrowly pyramidal.....5. *C. pusilla.*
Nutlets straight, usually dull; gynobase subulate.
Nutlets small, 0.5–0.7 mm. long.....9. *C. Grayi.*
Nutlets larger, 1.5–3 mm. long.
Nutlets triangular-ovate, with a suggestion of a medial dorsal ridge; plant dull dark green.....32. *C. muricata.*
Nutlets ovate to lance-ovate; plants canescent.
Spikes solitary.....26. *C. patula.*
Spikes commonly ternate or occasionally geminate or quinate.....28. *C. intermedia.*
Style definitely surpassed by or about reaching to the tips of the nutlets.
Corolla conspicuous, 2–5 mm. broad.
Calyx evidently pedicellate, conspicuously long-villous, not hispid or hirsute.....34. *C. crinita.*
Calyx sessile or subsessile, hirsute or hispid, at most inconspicuously short-villous.
Normally only 1 or 2 nutlets developing; gynobase short or medium-sized.
Nutlets usually horizontal, ovate-triangular, acuminate; calyx-lobes shorter than nutlet, very loosely connivent.....35. *C. excavata.*
Nutlets always erect, ovate-oblong or narrowly ovate; calyx-lobes evidently surpassing nutlets and closely connivent over them.
Abaxial nutlet developing; gynobase reaching 1/3–1/2 height of nutlet.....25. *C. decipiens.*
Axial nutlet developing; gynobase about 2/3 height of nutlet.....17. *C. utahensis.*
Normally all 4 nutlets developing; gynobase elongate, 2/3–3/4 height of nutlets.
Plant low, spreading and widely branched; spikes solitary.....33. *C. mariposae.*
Plant erect and ascendingly branched; spikes geminate or ternate.
Hairs on calyx subinflated, extremely coarse; stem usually stiffly erect and forming a conspicuous axis, branches

usually widely divaricate.....27. *C. foliosa.*
Hairs on calyx slender, not notably coarse; stem irregularly branched.
Calyx-lobes pungent-hirsute; nutlets oblong-ovate, verrucose.....28. *C. intermedia.*
Calyx-lobes densely hispid; nutlets ovate, tuberculate.....36. *C. Hendersoni.*
Corolla inconspicuous, 0.5–2 mm. broad.
Ovules 2, nutlet and calyx bent.....12. *C. recurvata.*
Ovules 4; nutlets and calyx straight.
Nutlets very small, ca. 1.5 mm. long; spikes somewhat bracted.....37. *C. Traskae.*
Nutlets larger, 2–3 mm. long, spikes very sparingly if at all bracteate.
Nutlets usually solitary; gynobase 1/4–1/2 height of nutlet.
Nutlet persistent, axial.....21. *C. texana.*
Nutlet finally deciduous, abaxial....25. *C. decipiens.*
Nutlets usually 4.
Nutlets decidedly ovate.
Plant closely strigose, pallid, usually 2–3 dm. tall; spikes commonly geminate or ternate.....39. *C. simulans.*
Plant spreading-hispid, usually 1–1.5 dm. tall; spikes usually solitary or rarely geminate.
Nutlets with low rounded tuberculations.....40. *C. ambigua.*
Nutlets with elongate papillae or spicules.....41. *C. echinella.*
Nutlets more or less lanceolate.
Stems spreading hirsute.....29. *C. barbigera.*
Stems strigose.
Nutlets verrucose or verrucose-muriculate.....30. *C. nevadensis.*
Nutlets spinular-muricate.....31. *C. scoparia.*

Description and Classification of the Species.

Ser. I. ANGUSTIFOLIAE. Nutlets 4, muricate or tuberculate, dark with pale roughenings, triangular-ovate or triangular-oblong, with sides acute or knife-like or definitely winged, homomorphous or in most species decidedly hetermorphous with odd nutlet abaxial larger and sometimes slightly less roughened than the others; style definitely surpassing the nutlets.

Pedicels slender, 1–4 mm. long; long-lived annuals.
Nutlets homomorphous, broadly winged.....1. *C. holoptera.*
Nutlets heteromorphous, narrowly winged.....2. *C. racemosa.*
Pedicels stout and very short, less than 1 mm. long.
Nutlets with a knife-like margin.
Nutlets heteromorphous.

Fruiting calyces ca. 2 mm. long; nutlets 0.6–0.7 mm. long.....3. *C. angelica.*
Fruiting calyces 2.5–3 mm. long; nutlets ca. 1.7 mm. long.
4. *C. inaequata.*
Nutlets homomorphous.
Nutlets coarsely tuberculate, bent; gynobase narrowly pyramidal.....5. *C. pusilla.*
Nutlets very obscurely roughened, straight; gynobase subulate.....6. *C. costata.*
Nutlets with merely a sharply angled margin.
Spikes bracteate throughout; style thick.....7. *C. micrantha.*
Spikes bractless or practically so; style slender.
Nutlets heteromorphous.....8. *C. angustifolia.*
Nutlets homomorphous.....9. *C. Grayi.*

1. **C. holoptera** (Gray) Macbr. Coarse erect annual, herbaceous or rarely somewhat suffruticose towards the base, 1–6 dm. tall; branches rather numerous and ascending, hirsute as well as strigose, usually drying brownish; leaves oblanceolate to lance-linear, 3–6 cm. long, 3–8(–12) mm. broad, acute or obtuse, coarsely pustulate and hirsute beneath but less so above; racemes geminate, naked or sparsely bracteate, usually ca. 5 cm. but becoming 10 cm. long; corolla inconspicuous, tube shorter than calyx, the ovate lobes ascending and less than 1 mm. long; fruiting calyx oblong-ovate, 2.5–3.5 mm. long, subsymmetrical, rather persistent; pedicels ascending or decurved, 0.7–1.5 mm. long; mature calyx-lobes lanceolate, somewhat connivent, midrib thickened and hirsute, margins strigose; nutlets 4, homomorphous, 1.5–2.5 mm. long, body oblong-ovate or triangular-ovate, dark with pale tuberculations, margin narrowly to quite broadly winged, groove open or closed above but dilated into an areola below; gynobase slender, about equalling the nutlets; style clearly surpassing the nutlets but shorter than calyx-lobes.—Contr. Gray Herb. n. s. xlviii. 44 (1916). *Eritrichium holopterum* Gray, Proc. Am. Acad. xii. 81 (1876). *Krynitzkia holoptera* Gray, l. c. xx. 276 (1885). *Oreocarya holoptera* Greene, Pittonia i. 58 (1887).

Deserts of California and western Arizona. Not common.

Arizona: Ehrenberg, 1876, *Palmer* (G, type); near Peach Springs, Grand Canyon, 1884, *Lemmon* (UC). California: sandy places near Palm Springs, 120 m. alt., *Spencer 2066b* and *2070* (G); Marshall Canyon, 16 km. west of Coachella, 90 m. alt., *Hall 5786* and *5788* (UC); Calexico, *Davy 8007* (UC); rocky talus slopes at foot of The Needles, *Grinnell* (UC); "The Caves," sink of the Mohave River, *Parish 9855* (UC).

This species was founded by Gray on two collections cited thus: "S. Utah, Capt. F. M. Bishop; Ehrenberg, Arizona, Palmer." The material collected by Bishop is an immature scrappy specimen of *C. pterocarya.* Palmer's Ehrenberg collection consists of two mounted

sheets with fruit. As would be suspected almost the whole of Gray's original description is based upon the Arizonian plant. Subsequently Gray excluded Bishop's collection and cited only the Ehrenberg material as representative of his species. For these reasons Palmer's Ehrenberg collection is taken as the type of *C. holoptera*.

2. **C. racemosa** (Wats.) Greene. Long-lived annual often decidedly suffruticose towards the base, 1–10 dm. tall; stems single with numerous ascending branches or many and diffusely branched, younger parts green, inconspicuously strigose and commonly hirsute, older parts woody and becoming brown from the falling away of the pale bark; leaves oblanceolate, acute, hirsute, pustulate, the early ones 3–6 cm. long and 6–12 mm. broad, the later and more abundant 1.5–4 cm. long and 2.5 mm. broad; racemes apparently forked and paniculately disposed, inconspicuously and irregularly bracted, 3–15 cm. long; corolla very inconspicuous, limb ca. 1 mm. broad; fruiting calyces oblong-ovate, ascending, 2–4 mm. long, slightly asymmetrical, tardily deciduous, inconspicuously biserial; pedicels usually well developed, 1–4 mm. long, slender, frequently nodding; mature calyx-lobes lance-linear, somewhat strigose, hirsute along the thickened midrib; nutlets 4, heteromorphous, triangular-ovate, the acute tips slightly out-curved, groove open or closed above but below broadening cut into a shallow broadly triangular areola; odd nutlet next the abaxial calyx-lobe, 1–2 mm. long, subpersistent, finely muricate or tuberculate or both, light or dark; consimilar nutlets 0.8–1.5 mm. long, acute, tending to be very narrowly winged, dark with pallid tuberculations; gynobase subulate, ¾ length of odd nutlet and about equalling consimilar nutlets; style much surpassing the nutlets, almost as long as the mature calyx-lobes.—Pittonia i. 115 (1887); Johnston, Proc. Calif. Acad Sci. ser. 4, xii. 1147 (1924). *Eritrichium racemosum* Wats in Gray, Proc. Am. Acad. xvii. 226 (1882). *Krynitzkia racemosa* Greene, Bull. Calif. Acad. Sci. i. 208 (1885). *Johnstonella racemosa* Brand, Fedde Repert. in press. *K. ramosissima* Gray, l. c. xx. 277 (1885). *C. suffruticosa* Piper, Proc. Biol. Soc. Wash. xxxii. 42 (1919). *C. racemosa*, var. *lignosa* Johnston, Univ. Calif. Pub. Bot. vii. 445 (1922). *J. racemosa*, var. *lignosa* Brand, Fedde Repert. in press.

Southern Nevada and western Arizona, and southwestward to middle Lower California and Carmen Island; usually growing in rocky places.

NEVADA: semishaded places, Las Vegas Mts., *Goodding 2381* (G, UC); Petrified Forest Canyon west of Logan, 540 m. alt., *Heller 10446* (G) and *10447*

(G, UC); rocks, Ash Meadows, *Purpus 6024* (UC). ARIZONA: Grand Canyon, 1885, *Gray* (G); Diamond Creek Canyon, *Wilson 170* (UC). CALIFORNIA: on and about rocks, Silver Canyon, White Mts. east of Laws, *Heller 8209* (G); Panamint Canyon, *Hall & Chandler 7034* (UC, TYPE of *C. racemosa*, var. *lignosa*); Surprise Canyon, *Parish 10125* (UC); Morongo Wash, 900 m. alt., *Parish 3337* (UC); among rocks on canyon-side, Palm Canyon, 300 m. alt., *Johnston 1002* (G); sandy places near Palm Springs, 120 m. alt., *Spencer 2079* (G); among rocks, Cathedral Canyon near Palm Springs, 150 m. alt., *Spencer 2078* (G); Borregos Springs, 1894, *Brandegee* (UC); San Felipe Creek, *Eastwood 2704* (G); Split Mt., 1905, *Brandegee* (UC); canyon near Mesquite Station, *Parish 775* (G, TYPE of *E. racemosum*; UC, ISOTYPE); desert sand, Colorado Desert, San Diego Co., *Spencer 254* (G). LOWER CALIFORNIA: Cantillas Mts., 1883, *Orcutt* (G); Cantillas Mts., 1884, *Orcutt* (G, UC); San Julio Canyon, 1889, *Brandegee* (UC); San Sebastian, 1884, *Brandegee* (UC); San Reguis, 1889, *Brandegee* (UC); Santa Maria, 1889, *Brandegee* (UC); Cajon de Santa Maria, 1889, *Brandegee* (UC); talus, Puerto Refugio, Angel de la Guarda Island, *Johnston 3374* (G); shaley slope, San Estaban Island, *Johnston 3175* (G); cobble-stone beach, South San Lorenzo Island, *Johnston 4192* (G); foot of cliff, Las Animas Bay, *Johnston 3505* (G); Santa Rosalia, *Palmer 188* (G); foot of gypsum cliff, San Marcos Island, *Johnston 3621* (G); Carmen Island, *Palmer 846* (G, UC).

A very distinctive plant to be confused only with *C. holoptera*, which has homomorphous, more broadly winged nutlets. The very diffusely branched form of *C. racemosa*, which is most common in the Mohave Desert, has been described as *C. racemosa*, var. *lignosa*. It may be worthy of recognition.

3. **C. angelica** Johnston. Much branched finely strigose herb 15–25 cm. high; stems spreading, rebranched, brown and glabrous below, strigose and canescent above; leaves linear, 8–24 mm. long, 1–2 mm. broad, loosely strigose, densely and minutely pustulate, ascending; spikes solitary, crowded, slender, naked, 4–9 cm. long, very floriferous; corolla minute, ca. 1 mm. long, ca. 0.5 mm. broad; fruiting calyces oblong-ovate, 1.5–2 mm. long, ascending, subsessile, somewhat asymmetrical; mature calyx-lobes linear, erect, ribbed, sparsely hispid, abaxial one slightly the longest and most hispid; nutlets 4, hetermomorphous, triangular-ovate, dark with small pale tuberculations, margins sharp and with a very narrow knife-edge, back convex, groove closed above but dilated below into a shallowly triangular areola; odd nutlet next the abaxial calyx-lobe, ca. 0.7 mm. long, somewhat persistent; consimilar nutlets ca. 0.6 mm. long; gynobase narrow, almost as long as the consimilar nutlets; style very much surpassing the nutlets.—Proc. Calif. Acad. Sci. ser. 4, xii. 1143 (1924).

Known only from Angel de la Guarda Island in the Gulf of California.

LOWER CALIFORNIA: on silty flats, Angel de la Guarda Island opposite Pond Island, *Johnston 4221* (G, UC, ISOTYPES).

A well marked species, probably most related to *C. racemosa*, from which it differs in such developments as smaller and sessile calyces, much smaller nutlets, and narrower leaves. To judge from the description of *C. inaequata* it differs from that species in its denser spikes, and much smaller calyces and nutlets. Except for the very narrowly winged margin, the nutlets of *C. angelica* are very suggestive of those of *C. Grayi*.

4. **C. inaequata** Johnston. Loosely and sparingly branched herb 3–4 dm. high; stems erect or ascending, hispid and strigose or hirsute towards the base; leaves oblanceolate to linear, 2–4 cm. long, acute, not numerous, more or less hispid, pustulate especially underneath; spikes geminate or solitary, 4–12 cm. long, at times sparsely bracted below; corolla inconspicuous, tube shorter than calyx; fruiting calyx ovate-oblong, 2.5–3 mm. long, ascending, pedicels less than 0.5 mm. long; mature calyx-lobes lanceolate, midrib thickened and hirsute, axial lobe most pubescent and thickened; nutlets 4, heteromorphous, triangular-ovate, dark with small pale tuberculations, margins decidedly acute, groove closed above but below gradually dilating into a shallow triangular areola; odd nutlet ca. 1.7 mm. long, somewhat persistent, slightly lighter than the others, next the abaxial calyx-lobe; consimilar nutlets ca. 1.3 mm. long; gynobase equalling the consimilar nutlets but surpassed by odd nutlet; style much surpassing the nutlets.—Univ. Calif. Pub. Bot. vii. 444 (1922). *Johnstonella inaequata* Brand, Fedde Repert. in press.

Southeastern California.

California: among rocks, Pleasant Canyon, Panamint Mts., 600 m. alt., *Hall & Chandler 6925* (UC, type); Baxter, *Parish 9859* (UC).

The status of this species is problematic, since the collections upon which it was based have not neen available to me for several years. The description given above is adapted from a preliminary diagnosis made in 1922. It is possible that the plant is only a form of *C. racemosa*, although it has been noted as differing in its subsessile calyces and less extended duration.

5. **C. pusilla** (T. & G.) Greene. Low plant usually with very numerous prostrate-ascending stems; these very slender, usually strictly branched, 3–15 cm. long, canescent, appressed villous-hirsute; leaves crowded near base of plant but distant above, spathulate-linear to linear, 1–3 cm. long, 1–2 mm. wide, somewhat pustulate and hispid below but less so above; spikes solitary or geminate, 2–8 cm. long, naked or with a few minute bracts; corolla inconspicuous, shorter than calyx, 1.5–2 mm. long, lobes slightly spreading oblong ca. 0.3

mm. long; fruiting calyces 2–2.5 mm. long, broadly ovate, symmetrical, sessile or subsessile, early deciduous; mature calyx-lobes lance-ovate or oblong-lanceolate, hirsute, midrib only slightly thickened; nutlets 4, homomorphous, lucid, ca. 0.8–1.2 mm. long, triangular-ovate, bent, tan-colored with low light-colored tuberculations, margin angled and beveled, groove opened or closed above but expanding below into a shallow open triangular areola; gynobase narrowly pyramidal, about equalling the nutlets; style much surpassing the nutlets, ca. ½ length of gynobase.—Pittonia i. 115 (1887). *Eritrichium pusillum* T. & G. Pacif. R. R. Rep. ii. pt. 2, 171 (1856). *Krynitzkia pusilla* Gray, Proc. Am. Acad. xx. 274 (1885).

Southern Arizona and New Mexico southward to Durango.

ARIZONA: near Nogales, 1902, *Orcutt* (UC); Douglas, 1907, *Goodding 2264* (UC). NEW MEXICO: without locality, *Wright 1571* (G, NY). TEXAS: Fort Davis, 1880, *Giard 65* (G); Kent, *Tracy & Earle 105* (UC); El Paso, *Jones 3741* (UC); Llano Estacado, *Pope* (NY, TYPE). CHIHUAHUA: hills and plains near Chihuahua, *Pringle 184* (G, UC); vicinity of Chihuahua, 1300 m. alt., *Palmer 65* (G). DURANGO: Tepehuanes, *Palmer 28* (G, UC); Durango, *Palmer 139* (G, UC) and *227* in pt. (G).

A very distinct species readily recognized by its beveled, bent, lustrous nutlets that just equal the somewhat basally constricted gynobase. The type is given as coming from "Rio Pecos to Llano Estacado, etc. in sandy soil, March." From a study of the journal in Pope's Report, the locality given is found to be within about 100 kilometers traveled between March 24th and 26th 1854. This would make the type locality lie somewhere near the juncture of Ward, Crane and Ector counties, Texas.

6. **C. costata** Brandg. Coarse stiff few-branched herb 1–2 dm. high; stems (especially younger parts) canescent, densely villous-strigose and usually somewhat hirsute as well; leaves lanceolate to linear, 1–3 cm. long, 2–4 mm. wide, broadest near base, apex acute, above villous-strigose and sparsely hispid, beneath more hispid and frequently also pustulate; spikes rigid, 2–5 cm. long, solitary or geminate, sparsely leafy-bracted; corolla inconspicuous, ca. 2 mm. long, tube shorter than calyx, lobes broad and ascending; fruiting calyces ovate-oblong, 4–6 mm. long, subsymmetrical, spreading, deciduous, subsessile; mature calyx-lobes linear-lanceolate, somewhat connivent above with tips slightly spreading, midrib thickened hirsute, margins strigose; nutlets 4, homomorphous or subheteromorphous with the nutlet next the abaxial calyx-lobe slightly the largest, ca. 1.8 mm. long, triangular oblong-ovate, back strongly convex, inconspicuously rugulose or faintly verrucose, face noticeably flat or even

slightly convex, margins sharp and narrowly winged; groove very shallow, closed above but dilating below and merging into the deltoid shallow areola; gynobase subulate, equalling the nutlets; style not sharply differentiated from the gynobase, much surpassing the nutlets.—Bot. Gaz. xxvii. 453 (1899). *C. scorsa* Macbr. Contr. Gray Herb. n. s. xlviii. 46 (1916).

Deserts of Southern California.

California: Needles, *Jones 3841* (G, type of *C. scorsa;* UC, isotype); gravelly hillside 17 km. west of Needles, 210 m. alt., *Munz & Harwood 3601a* (UC); sandy desert, Blythe Junction, 360 m. alt., *Munz & Harwood 3587* (UC); in desert sand near mouth of Tahquitz Canyon, 210 m. alt., *Spencer 1524* (G); in sand, Palm Canyon, 180 m. alt., *Spencer 1527* (G); margin of wash, Borregos Spring, 1889, *K. Brandegee* (UC); Borregos Spring, 1895, *Brandegee* (UC, type of *C. costata);* Hodges Mts., *Hall 5974* (UC); sand hills near Travertine Terrace, 52 m. below sea-level, *Parish 8429* (UC); in desert sand, Mecca, 57 m. below sea-level, *Spencer 1514* (G); Mecca, 60 m. below sea-level, *Parish 8465* (G).

A very distinct species readily recognized by its peculiar nutlets and by its rather coarse, stiff habit and very canescent herbage.

7. **C. micrantha** (Torr.) Johnston. Slender strigose ascendingly branched dichotomous herb 5–15 cm. high, drying brownish; root and lower parts of stem stained with dye; leaves oblong-oblanceolate, 3–7 mm. long, 0.8–1.4 mm. broad, canescent-strigose and occasionally short villous-hirsute, rounded at apex, uppermost scarcely reduced and extending through the inflorescence; spikes very numerous, solitary or geminate, dense, strongly unilateral, leafy-bracted throughout, 1–4 cm. long; corolla inconspicuous or medium-sized, limb 0.5–2.5 mm. broad, faucal appendages poorly developed; fruiting calyx ovate-oblong, 1.8–2.5 mm. long, slightly asymmetrical, decidedly biseriate, base broadly conical; pedicels 0.5–0.8 mm. long; mature calyx-lobes oblong-lanceolate, broad, erect, hirsute, midrib not particularly thickened; nutlets 4, homomorphous or somewhat heteromorphous, 1–1.3 mm. long, plumbeous or brown, smooth or tuberculate, abaxial one usually a trifle the largest and most persistent; groove extending full length of nutlet, narrow, scarcely broadened at base; gynobase subulate, nearly as long as the calyx, much surpassing the nutlets and bearing at its summit the sessile stigma.—Contr. Gray Herb. n. s. lxviii. 56 (1923).

Var. **genuina.** Corolla inconspicuous, 0.5–1.2 mm. broad.—*Eritrichium micranthum* Torr. Bot. Mex. Bound. 141 (1859). *Krynitzkia micrantha* Gray, Proc. Am. Acad. xx. 275 (1885). *Eremocarya micrantha* Greene, Pittonia i. 59 (1887). *C. micrantha* Johnston, l. c.

Eremocarya muricata Rydb. Bull. Torr. Bot. Cl. xxxvi. 677 (1909); Macbr. Proc. Am. Acad. li. 545 (1916).

Southeastern Oregon to Utah, southward to northern Lower California and Arizona, and eastward along the Mexican boundary to western Texas.

Oregon: without locality, 1898, *Cusick 2020a* (G). Utah: Stansbury Island, 1290 m. alt., *Watson 856* (G); valley of the Virgin near St. George, *Parry 164* (G, isotype of *E. muricatum*). Nevada: Logan, *Kennedy 1832* (G); dry sandy ravines, Moapa, *Goodding 2203* (G); deep sand, Beaver Dam Wash, *Goodding 2144* (G). California: sandy place, Mohave Desert, 300 m. alt., *Spencer 436* (G); Barstow, *Jones 106* (G); Mohave Desert, 1880, *Lemmon* (G); Acton, *Elmer 3682* (G); Los Angeles, 1880, *Nevin* (G); sand in Arroyo Seco, Pasadena, *Allen 18* (G); dry sandy ground, San Gabriel Wash near El Monte, *Johnston 27r* (G); San Bernardino, 1876, *Parry 14* (G); sandy hills, Mesa Grande, 990 m. alt., *Spencer 1304* (G); Agua Caliente, *Parish 771* (G); sandy place near Palm Springs, 120 m. alt., *Spencer 1918* (G); desert sand, Palm Springs, 135 m. alt., *Spencer 844* (G); desert sand, Coyote Wells, *Spencer 194* (G); desert sand, Mecca, 59 m. below sea-level, *Spencer 1515* (G); desert sand, Mountain Springs, 678 m. alt., *Spencer 857* (G). Lower California: San Sebastian, 1889, *Brandegee* (UC); without locality, 1883, *Orcutt* (G). Arizona: near Tucson, *Greene 1112* (G); Wickinburg, *Palmer 371* (G); near Camp Lowell, 1881, *Pringle* (G); Prescott, *Rusby 745* (G). New Mexico: without locality, 1851–2, *Wright 1565* (G). Texas: sands along Rio Grande, El Paso, *Thurber 181* (G); El Paso, *Jones 3703* (G).

Var. **lepida** (Gray) Johnston. Corolla medium-sized, 1.0–1.5 mm. broad; plants usually coarser than in var. *genuina*.—Contr. Gray Herb. n. s. lxviii. 57 (1923). *Eritrichium micranthum*, var. *lepidum* Gray, Synop. Fl. N. Am. ii. pt. 1, 193 (1886). *Krynitzkia micrantha*, var. *lepida* Gray, Proc. Am. Acad. xx. 275 (1885). *Eremocarya lepida* Greene, Pittonia i. 59 (1887). *Eremocarya micrantha*, var. *lepida* Macbr. Proc. Am. Acad. li. 545 (1916).

Southern California, most common in warm montane valleys.

California: Middle Fork, Mt. Pinos, *Hall 6540* (UC); Grayback, 1880, *Wright* (G); near Pine Lake, Bear Valley, *Abrams 2904* (G); Forest Home, 1500 m. alt., 1913, *Mason* (G); Bear Valley, *Parish 771a* (G); sandy hills, Idyllwild, 1590 m. alt., *Spencer 1301* (G); woods, Idyllwild, 1620 m. alt., *Spencer 1347* (G); Warners Hot Springs, *Eastwood 2591a* (G); dry canyon floor near Campo, *Abrams 3594* (G); desert sand, Mountain Springs, 678 m. alt., *Spencer 858* (G); San Diego, 1876, *Cleveland* (G, type of *E. micranthum*, var. *lepidum*). Lower California: San Pedro Martir, 1893, *Brandegee* (UC).

The nutlets of *C. micrantha* are exceptionally variable. Some plants have all the nutlets smooth, others have all of them tuberculate, while still others have the abaxial nutlet of each calyx tuberculate and the remaining ones smooth. *Eremocarya muricata* is described as differing from *C. micrantha* in having tuberculate nutlets, but in the isotype of that species contained in the Gray Herbarium I find that

although most of the calyces have roughened nutlets a few of them (and these always the oldest) have decidedly smooth nutlets. In plants characteristically smooth-fruited it is quite common to find that the oldest calyces contain three smooth nutlets and a tuberculate one. Not only is there a decided tendency towards heteromorphism in markings and roughenings, but to a slight degree also in size and firmness of attachment. The abaxial nutlet is commonly a trifle larger than the other nutlets and is somewhat more firmly attached to the gynobase. None of the nutlet-variations can be geographically correlated. Despite its variable fruit the species is readily recognized because of its densely bracteate inflorescence, deeply dye-stained root and long-protruded gynobase.

8. **C. angustifolia** (Torr.) Greene. Diffusely branched from the base, 5–20(–45) cm. tall; stems canescent, villous-hirsute, commonly somewhat strigose-villous, lowermost branches decumbent or loosely ascending; leaves linear, 1.5–4 cm. long, 1–4 mm. wide, spreading, not crowded below, hispid or strigose, somewhat pustulate especially underneath; spikes geminate, usually ca. 5 cm. long, rather dense, commonly naked; corolla usually inconspicuous, tube 1–2 mm. long, limb 1–2.5 mm. broad; fruiting calyces ovate-oblong, 3–4 mm. long, stiffly ascending, strongly biseriate, slightly asymmetrical; pedicels less than 0.5 mm. long; mature calyx-lobes lance-linear, rigid, slightly connivent, midrib thickened and hirsute, margin somewhat villous-ciliate, abaxial lobe longest and most hirsute; nutlets normally 4, heteromorphous, ovate-oblong, brown or plumbeous with pale tuberculations or rarely murications, back convex, face flattish, margin somewhat angular; odd nutlet next the abaxial calyx-lobe, a trifle larger and more persistent than the similarly colored and shaped consimilar nutlets which are ca. 1 mm. long, groove usually narrowly open above but broadening at the base; gynobase columnar, equalled by consimilar nutlets but shorter than odd nutlet; style usually surpassing even the odd nutlet.—Pittonia i. 112 (1887). *Eritrichium angustifolium* Torr. Pacif. R. R. Rep. v. 363 (1857). *Krynitzkia angustifolia* Gray, Proc. Am. Acad. xx. 272 (1885).

Southern California and southern Utah, southward to Lower California, Sonora and western Texas.

California: Death Valley, *Coville & Funston 479* (G); Danby, 1896, *Orcutt* (UC); Barstow, 1915, *K. Brandegee* (UC); sandy places near Barstow, 960 m. alt., *Spencer 2091* (G); Needles, 1884, *Jones* (G); Riverside Mt., 1910, *Grinnell* (UC); Palm Springs, 1913, *Eastwood* (G); in sandy places, Palm Springs, *Spencer 843, 849, 853, 855, 1526a, 2066a, 2071b* in pt. and *2118* (G); sand dunes, Old Beach, near Holtville, *Parish 8124* (UC); Twentynine Palms,

1902, *Brandegee* (UC); desert sand, Indio, 30 m. alt., *Spencer 1517* (G); sandy wash, Shaver's Well near Mecca, 59 m. below sea-level, *Munz & Keck 4763* (G); sands, Mecca, *Spencer 1512* and *1785* (G); Cameron Lake, *Brandegee* (UC); Yaqui Wells, *Eastwood 2632* (G); bottom lands near Colorado River, 750 m. alt., *Hall 5922* (UC); in sandy places. Colorado Desert, *Spencer 195*, *196*, *197* and *201* (G); without locality, *Coulter 500* (G). LOWER CALIFORNIA: stony ridges, Los Angeles Bay, *Palmer 606* (G); San Agueda, *Palmer 241* (G, UC); Angel de la Guarda Island, *Johnston 4227* (G). NEVADA: Moapa, *Goodding 2181* (G, UC); Overton, 450 m. alt., *Heller 10439* (G); Amargosa in moist place near station, 900 m. alt., *Heller 10976* (G); sandy wash, Meadow Valley Wash, *Goodding 2169* (G); Muddy Valley, *Kennedy & Goodding 26* (UC). ARIZONA: Fort Yuma, *Thomas* (NY, TYPE); Fort Yuma, *DuBarry* (NY, COTYPE); Gila River, *Thurber 690* (G); Tucson, 1907, *Loyd* (G); Tucson, 1884, *Parish* (G); Tucson, 1894, *Toumey* (UC); campus of University of Arizona, *Thornber 407* and *516* (UC); without locality, 1876, *Palmer* (G); without locality, 1881, *Pringle* (G). SONORA: Torres, 1902, *Purpus* (UC); dry places, Canyon of Guadaloupe, *Smith* (NY); Las Durasnillas, 1892, *Brandegee* (UC); Guaymas, *Palmer 169* (G, UC). NEW MEXICO: mesa west of Organ Mts., 1905, *Wooton* (UC). TEXAS: El Paso, 1884, *Jones* (G).

Probably the most common *Cryptantha* in the lower deserts of California. It is readily recognized by its characteristic ashy herbage, dense spikes, and heteromorphous dark nutlets which are covered with small light colored low tubercles. It is a well marked species, having its closest relation in *C. Grayi*.

9. **C. Grayi** (Vasey & Rose) Macbr. A small slender herb 5–15 (–18) cm. high; stems usually several, strict or spreading, appressed or spreading villous-hispid; leaves quite numerous, linear, 1–4 cm. long, 1–2 mm. wide, densely pustulate-setose beneath but much less so above, basal ones somewhat aggregated, upper ones reduced; spikes usually geminate, naked, densely flowered, 1–4 cm. long; corolla minute to medium-sized, tube shorter than calyx, limb 0.5–3 mm. broad; fruiting calyx oblong-ovate, 1–2 mm. long, sessile or subsessile, decidedly biseriate; mature calyx-lobes lance-linear, rigid, slightly connivent, midrib short-hirsute, margins somewhat villous-hispid, axial lobe most pubescent; nutlets 4, homomorphous, very small, 0.5–0.7 mm. long, triangular-ovate, dark colored, usually bearing light-colored low tuberculations, edges angled or rounded, areola shallow and deltoid with the groove above it commonly closed; gynobase subulate, equalling or a little shorter than the nutlets; style much surpassing the nutlets.—Contr. Gray Herb. n. s. xlviii. 43 (1916).

Var. **genuina**. Corolla conspicuous, 2–3 mm. broad; nutlets tuberculate.—*Krynitzkia Grayi* Vasey & Rose, Proc. U. S. Nat. Mus. xi. 536 (1888). *C. Grayi* Macbr. l. c.

Middle Lower California.

LOWER CALIFORNIA: Lagoon Head, *Palmer 801* (G, UC, ISOTYPES); Calmalli, *Purpus* (UC); Magdalena Island, *Orcutt 27*, *52* and *80* (G); Magdalena Bay, 1889, *Brandegee* (UC); Santa Margarita Island, 1889, *Brandegee* (UC).

Var. **nesiotica** Johnston. Corolla inconspicuous, 0.5–1 mm. broad; nutlets very sparsely or not at all tuberculate.—Proc. Calif. Acad. Sci. ser. 4, xii. 1146 (1924).

Dunes on islands in southern part of Gulf of California.

LOWER CALIFORNIA: very common on dunes, San Francisco Island, *Johnston 3947* (G, UC, ISOTYPE).

Var. **cryptochaeta** (Macbr.) Johnston. Corolla inconspicuous, 0.5–1 mm. broad; nutlets abundantly tuberculate.—Proc. Calif. Acad. Sci. ser. 4, xii. 1145 (1924). *C. micromeres*, var. *cryptochaeta* Macbr. Contr. Gray Herb. n. s. xlviii. 46 (1916). *C. filiformifolia* Macbr. l. c. 45.

Extreme southern Lower California and Sonora.

LOWER CALIFORNIA: Cape San Lucas, *Xantus 76* (G); sandy clearings, La Paz, *Johnston 3071* (G); San José del Cabo, *Anthony 347* (G, TYPE of *C. micromeres*, VAR. *cryptochaeta*). SONORA: Alamos, *Palmer 397* (G, TYPE of *C. filiformifolia;* UC, ISOTYPE); Alamos, *Goldman 308* (G).

Cryptantha Grayi is very closely related to *C. angustifolia*, and from the infrequent extremely slender forms of the latter it is distinguishable only by its decidedly homomorphous nutlets. Usually, however, it is readily recognized by its very slender habit, and by its herbage which usually dries a darker color than that of *C. angustifolia*.

Ser. II. CIRCUMSCISSAE. Nutlets 4, smoothish or inconspicuously muricate, dark, triangular-ovate, with acute sides, homomorphous or subheteromorphous with the abaxial nutlet just appreciably the largest; style equalling or barely surpassing the nutlets; calyx circumscissile at maturity.

10. **C. circumscissa** (H. & A.) Johnston. Low herb 2–10 cm. high, trimly erect or much branched and forming hemispherical masses; stems few to numerous, more or less branched above, strigose or hirsute, the outermost somewhat decumbent; leaves oblanceolate, 3–15 mm. long, 1–2 mm. broad, obtusish, surface siliceous especially toward the pale base, strigose or hirsute, obscurely pustulate, upper ones scarcely reduced and extending through the inflorescence as foliaceous bracts; flowers axillary, the racemose arrangement obscure; corolla more or less inconspicuous, 1–2(–3) mm. broad; fruiting calyx 2.5–4 mm. long, oblong-ovate, united to near the middle, at maturity upper half falling away by a circumscission just below the sinuses;

basal persistent part of calyx-tube siliceous, pale, cupulate, appressed-hirsute; mature calyx-lobes firm-herbaceous, linear-lanceolate, scarcely ribbed, more or less hirsute; pedicels obscure, ca. 0.5 mm. long; nutlets 4, homomorphous or with abaxial one barely the largest, smooth or obscurely muriculate, triangular-ovate or oblong-lanceolate, 1.2–1.7 mm. long, back flattened especially towards apex, margins angled, groove closed and forked below; gynobase about ⅔ height of nutlets, pyramidal-oblong; style equalling or barely exceeded by nutlets.—Contr. Gray Herb. n. s. lxviii. 55 (1923).

Var. **genuina.** Stems with short appressed hairs.—*Lithospermum circumscissum* H. & A. Bot. Beechey 370 (1840). *Piptocalyx circumscissus* Torr. in Wats. Bot. King Exped. 240 (1871); Torr. Bot. Wilkes Exped. 414, t. 12 (1874). *Eritrichium circumscissum* Gray, Proc. Am. Acad. x. 58 (1874). *Krynitzkia circumscissa* Gray, Proc. Am. Acad. xx. 275 (1885). *Wheelerella circumscissa* Grant, Bull. So. Calif. Acad. Sci. v. 28 (1906). *Greenocharis circumscissa* Rydb. Bull. Torr. Bot. Cl. xxxvi. 677 (1909). *C. depressa* Nels. Bot. Gaz. xxxiv. 29 (1902).

Southern British Columbia and Idaho, southward to Arizona and northern Lower California.

WASHINGTON: Junction of Coal and Crab creeks, 730 m. alt., *Sandberg & Leiberg 228* (G); in dried up pools, Pasco, *Piper 2966* (G); Ainsworth, 1883, *Brandegee* (G); plains, Morgan's Ferry, Yakima River, *Suksdorf 404* (G). OREGON: open sandy places, Bend, *Nelson 859* (G); dry sandy slope along Des Chutes River, 8 km. below Bend, *Peck 9709* (G); plains between Pineville and Bear Buttes, 1110 m. alt., *Leiberg 324* (G); dry ground, Burns, *Peck 6108* (G). IDAHO: Boise, 1881, *Wilcox* (G); dry soil, 11.2 km. west of St. Anthony, *Merrill & Wilcox 873* (G, ISOTYPE of *C. depressa*); dry gravelly bottom-land, Falk's Store, *Macbride 29* (G); Snake Country, *Burke* (G); sandy slopes, Emmett, 660 m. alt., *Macbride 786* (G). UTAH: Antelope Island, 1290 m. alt., *Watson 847* (G); valley of the Virgin near St. George, *Parry 165* (G); St. George, 1880, *Jones* (UC); without locality, 1873, *Bishop* (G). NEVADA: Pyramid Lake, *K. Brandegee* (G, UC); Carson City, 1500 m. alt., *Watson 848* (G); Humboldt Plains, 1872, *Gray* (G); Carson City, *Anderson 163* (G); Lake Washoe, *Torrey 336* (G); near Empire City, *Torrey 332* (G); Reno, 1884, *Curran* (G); log railroad north of Verdi, 1590 m. alt., *Heller 10877* (G); about Carson City, 1446 m. alt., *Baker 973* (G); gravelly soil, Palmetto Range, *Purpus 5841* (G, UC). ARIZONA: Cottonwood, *Palmer 372* (G). CALIFORNIA: Sierra County, 1875, *Lemmon* (G); Tioga Road, east side of the divide, 2550 m. alt., *Smiley 820* (G); sandy plains, South Fork of Kern River, *Purpus 5712* (G, UC); base of White Mts. east of Laws, *Heller 8235* (G); sandy places, Erskin Creek, *Purpus 5304* (G); Acton, *Elmer 3705* (G); hills bordering Mohave Desert, 1882, *Pringle* (G); sand, Mohave, *Heller 7764* (G); desert sand near Victorville, 600 m. alt., 1918, *Spencer* (G); desert sand, Hesperia, *Spencer 387* (G); near Pine Lake, Bear Valley, *Abrams 2905* (G); sandy soil, Jacumba, *Abrams 3659* (G); Cottonwood Springs, *Jaeger 1846* (G). LOWER CALIFORNIA: without locality, 1884, *Orcutt* (G).

Var. **hispida** (Macbr.), comb. nov. Stems clothed with spreading bristles; plant usually coarser than in var. *genuina.—Greeneocharis circumscissa*, var. *hispida* Macbr. Proc. Am. Acad. li. 546 (1916). *Krynitzkia dichotoma* Greene, Bull. Calif. Acad. Sci. i. 206 (1885). *Piptocalyx dichotomus* Greene, Pittonia i. 60 (1887). *Wheelerella dichotoma* Grant, Bull. So. Calif. Acad. Sci. v. 28 (1906). *Greeneocharis dichotoma* Macbr. l. c. *C. dichotoma* Johnston, Contr. Gray Herb. n. s. lxviii. 55 (1923).

Western Nevada and adjacent California. Infrequently collected.

NEVADA: between Boca and Verdi, 1884, *Curran* (G, ISOTYPE of *K. dichotoma*); Carson City, *Anderson* (G). CALIFORNIA: Andrews Camp, Bishop Creek, 2400 m. alt., *Davidson 2700* (G); trail to Mt. Whitney, 3000 m. alt., *Culberton 4240* (G, TYPE of *G. circumscissa*, var. *hispida*); sandy plains, Erskin Creek, *Purpus 5304* in pt. (G).

A detailed study of *C. circumscissa* and *C. dichotoma* has failed to disclose any fundamental character capable of separating the two. The nutlet-characters used by Gray and Greene are not distinctive, since among plants of indubitable *C. circumscissa* the nutlets not only vary from triangular-ovate to oblong-lanceolate, but also from smooth and shiny to very finely granulate and minutely muriculate. The size of the nutlets does not separate natural groups. The only tangible character separating *C. circumscissa* and *C. dichotoma* seems to be one of pubescence. Since all the material with spreading bristles comes from a definite region along the east base of the Sierra Nevada I believe that this hirsute form is best treated as a geographical variety. Consequently Macbride's varietal name is taken up. It is to be noted that annotations in the Gray Herbarium indicate that even Gray inclined towards treating *C. dichotoma* as a mere variety.

Ser. III. ALBIDAE. Nutlets 4, coarsely tuberculate, dark, triangular-ovate, thickish, very broadly obtuse or convex on the sides, homomorphous but with the abaxial nutlet subpersistent; style much surpassing the nutlets.

11. **C. albida** (HBK.) Johnston. An erect or frequently loosely ascending herbaceous or fruticulose plant 1–3(–4) dm. high; stems solitary or usually several, simple or commonly paniculately branched, more or less villous-strigose as well as hirsute; early leaves in evanescent basal rosettes, spathulate, becoming 5 cm. long, 1.5–4 mm. wide; cauline leaves numerous and somewhat crowded, reduced above but extending as linear bracts through the inflorescence, 3 cm. or less long, hirsute, usually minutely pustulate; spikes 1–7 cm. long, solitary,

numerous, loosely bracteate; corolla inconspicuous, ca. 2.5 mm. long, tube about equalling calyx; fruiting calyx broadly ovate, 2–3 mm. long, only slightly accrescent, becoming remote, subpersistent; mature calyx-lobes oblong-ovate to lance-ovate, loosely connivent, midrib slightly thickened and short-hirsute, margin appressed-hispid; pedicels ca. 0.5 mm. long; nutlets 4, homomorphous, triangular ovate, 1–1.5 mm. long, tan or brownish, usually sparsely granulate, low-tuberculate, thickish, one next abaxial calyx-lobe subpersistent, margins rounded, ventral side occupied by a very large open triangular areola which appears to be excavated in very mature nutlets by the breaking away of the attachment-scar from the nutlet-walls; gynobase narrowly pyramidal, about equalling the nutlets; style much surpassing nutlets. —Contr. Gray Herb. n. s. lxviii. 53 (1923). *Myosotis albida* HBK. Nov. Gen. et Sp. iii. 91 (Aug. 1818). *Lithospermum ramosum* Lehm. Asperif. ii. 328 (Nov. or Dec. 1818). *Eritrichium ramosum* A. DC. Prodr. x. 132 (1846). *Krynitzkia ramosa* Gray, Proc. Am. Acad. xx. 274 (1885). *C. ramosa* Greene, Pittonia i. 115 (1887). *E. hispidum* Buckley, Proc. Acad. Philad. 1861, pg. 462 (1861). *K. mexicana* Brandg. Zoe v. 182 (1904); Macbr. Contr. Gray Herb. n. s. xlviii. 49 (1916).

Western Texas to eastern Arizona in the vicinity of the international boundary, thence south to Durango and Puebla.

Texas: Davis Mts., *Tracy & Earle 176* (G); Maxon Springs, *Havard 46* (G); valley of Limpia, 1858, *Hayes* (G); Pecos, 1858, *Hayes* (G); without locality, 1874, *Buckley* (G, fragment of type of *E. hispidum*); without locality, *Wright 1572* and *488* in pt. (G). Arizona: waste land, Douglas, *Goodding 2395* (G); sandy plain near the Mustang Mts., 1884, *Pringle* (G). Coahuila: Rio Grande Valley near Diaz, 200 m. alt., *Pringle 8301* (G, UC); mts. 10 km. east of Saltillo, *Palmer 2046* (G); Urios, 72 km. east of Saltillo, *Palmer 896* (G); vicinity of Saltillo, *Palmer 243* and *343* (G); Parras, *Purpus 2402* (G, UC); dry places southwest of Encantada, 1847, *Gregg* (G); Viesca, *Purpus 126* (UC, type of *K. mexicana*; G, isotype); without locality, *Gregg 32* (G). Chihuahua: foothills of Sierra Madra near Colonia Juarez, *Nelson 6343* (G). Durango: City of Durango, *Palmer 227* (G, UC). San Luis Potosi: San Luis Potosi, *Parry & Palmer 623* (G); San Rafael Mts., *Schaffner 731* (G). Aguas Calientes: in fields, Aguas Calientes, *Hartweg 157* (G). Hidalgo: between San Juan del Rio and Hacienda de San Antonio, *Humboldt* (G, authentic fragment of *M. albida*). Mexico: sandy fields, Amecameca, *Pringle 6648* (G, UC); San Juan Teotihuacan, District of Tezcoco, *Seler 5304* (G). Puebla: Mt. Orizaba, 3000 m. alt., *Seaton 173* (G).

The nutlets of this species are very thick in relation to their breadth. This condition, as well as the very large open (in age excavated) triangular areola, makes the species readily recognizable. It is practically confined to eastern Mexico where in Puebla it sets the southernmost outpost for the genus in North America. Not only is it the

most southerly ranging of the North American species, but it is the only North American species which appears to have its immediate relationships in the continent to the south. *Cryptantha albida* is very closely related to *C. argentinica* Brand of northern Argentina, if indeed it is not the same species.

Ser. IV. MARITIMAE. Nutlets 1–4, tuberculate or muricate, usually dark with pale roughenings, lanceolate to triangular-ovate, with rounded or obtuse sides, decidedly heteromorphous with odd nutlet (sometimes alone developing) axial and larger as well as occasionally less roughened than others; style surpassed by the nutlets or reaching their tips or rarely surpassing them.

Calyx most hirsute on axial side, conspicuously recurved or deflexed.
  Ovules 2; nutlet 1, bent; style reaching to about 1/2 height of nutlet.....12. *C. recurvata.*
  Ovules 4; nutlets 4, straight; style reaching to about the tips of the nutlets.....13. *C. echinosepala.*
Calyx most hirsute on abaxial side, spreading to strict.
  Calyx strictly and closely appressed to the flattened rhachis, gibbous on axial side due to basal prolongation of rough odd nutlet.....14. *C. dumetorum.*
  Calyx ascending or spreading, not at all gibbous; odd nutlet rather smooth.
    Nutlets triangular-ovate, 0.7–0.9 mm. long; mature calyx subglobose, minute, with lobes scarcely surpassing the nutlets.....15. *C. micromeres.*
    Nutlets oblong-lanceolate, 1–2 mm. long; mature calyx oblong, medium-sized, with lobes surpassing the nutlets. 16. *C. maritima.*

12. **C. recurvata** Cov. Ascendingly branched rather slender herb 1–3 dm. high; root frequently dye-stained; stems usually strigose, rarely appressed-hispid; leaves remote, oblanceolate or linear-oblanceolate, 1–2(–3.2) mm. long, 2–4(–5) mm. broad, rounded or obtuse, appressed-hispid, densely and minutely pustulate; spikes naked, slender, loose, 2–10 cm. long, solitary or geminate; corolla inconspicuous, subtubular, ca. 2 mm. long, not exserted, lobes short; fruiting calyces slender, subdistichously biseriate, very asymmetrical, characteristically bent and recurved, 3–4 mm. long, tardily deciduous, sessile; mature calyx-lobes linear, midrib somewhat thickened and hirsute, rarely merely strigose, axial lobe longest thickest and most hirsute; ovules 2; nutlet 1, subpersistent, oblong-lanceolate, inwardly curved, brownish, dull, granulate-muriculate, next the axial calyx-lobe, edges obtusish; groove somewhat oblique, narrow or closed, opening into a small basal areola; gynobase slender, ca. ½ length of

the matured nutlet, slightly exceeded by aborted one; style commonly much surpassed by nutlet.—Contr. U. S. Nat. Herb. iv. 165, t. 16 (1893).

Eastern Oregon to Utah and the Inyo Region of California.

Oregon: Alword Desert, 1600 m. alt., *Leiberg 2425* (G, UC). Nevada: in open sand along water-pipe, Candelaria, 1950 m. alt., *Shockley 260* (G); sandy soil, Palmetto Range, 1800–2100 m. alt., *Purpus 5856* (UC). Utah: sandy places, Grand River Canyon, 1230 m. alt., *Purpus 6488* (UC); Dugway, 1891, *Jones* (UC). California: Surprise Canyon, Panamint Mts., 800 m. alt., *Coville & Funston 713* (G, UC, isotypes); Silver Canyon in White Mts., east of Laws, *Heller 8221* (G, UC); Silver Canyon, 1913, *K. Brandegee* (G, UC); Fish Lake Valley, 1897, *Purpus*.

One of the most distinct and interesting species in the genus. It may be readily recognized by its biovulate fruit and spreading, recurved fruiting calyces.

13. **C. echinosepala** Macbr. Loosely branched herb 1–2 dm. high; stems usually reddish, strigose as well as somewhat hirsute; leaves 2–4.5 cm. long, 2–5 mm. wide, linear to linear-lanceolate, below pustulate and short villous-hirsute, above subglabrate or minutely strigose; spikes geminate or solitary, usually 2–5 cm. long, naked or rarely with a single bract; corolla inconspicuous, tube shorter than calyx, limb ca. 1 mm. broad; fruiting calyx ovate, 2–3 mm. long, sessile or subsessile, spreading or even reflexed, asymmetrical; mature calyx-lobes very unequal, lance-linear, strigose and usually hirsute along the thickened midrib, axial lobe the longest and most hirsute; nutlets heteromorphous, usually 4, pallid, groove narrow and scarcely dilated below; odd nutlet minutely muriculate-tuberculate, ovate, acute, 1.2–1.5 mm. long, subpersistent, next the axial calyx-lobe, margin angulate; consimilar nutlets ca. 1 mm. long, minutely tuberculate, lance-ovate; gynobase evidently shorter than consimilar nutlets, oblong; style longer than consimilar nutlets, equalling or just surpassed by the odd nutlet.—Contr. Gray Herb. n. s. lvi. 57 (1918); Johnston, Proc. Calif. Acad. Sci. ser. 4, xii. 1147 (1924).

Southern Lower California.

Lower California: Santa Agueda, *Palmer 242* (G); Magdalena Bay, *Lung* (UC), *Bryant* (UC), *Brandegee* (UC); Magdalena Island, *Orcutt 15* (G, type); La Paz, *Palmer 26* (G).

At once distinguishable from nearly all other species of the genus by having its fruiting calyces deflexed and most heavily hirsute on the axial side. It is probably most related to *C. angustifolia*.

14. **C. dumetorum** Greene. Laxly branched closely strigose herb; stems at first erect but later commonly much elongated and sprawling

or scrambling among bushes; leaves lanceolate, thickish, 2–4 cm. long, 2–4(–8) mm. wide, sparsely appressed hirsute-villous, closely pustulate below and finely so above; spikes solitary or geminate, usually remotely flowered, 5–10 cm. long, occasionally with foliaceous bracts towards base, rhachis brittle and tortuously flattened; corolla inconspicuous, ca. 1 mm. broad; fruiting calyx closely appressed to rhachis, 2–3 mm. long, very asymmetrical, not at all deciduous, base very oblique and downwardly gibbous on axial side; mature calyx-lobes connivent and reaching about equal height; 3 abaxial lobes lanceolate, somewhat strigose, with the thickened midribs deflexed-hirsute; 2 axial lobes partly united, hirsute only on outer margins; nutlets 4, heteromorphous, granulate and muriculate; odd nutlet persistent, axil, broadly lanceolate, 2–3 mm. long, base much developed and distorting the calyx, groove open and broad; consimilar nutlets 1.5–2 mm. long, deciduous, lanceolate, groove closed or very narrow; gynobase narrow, shorter than consimilar nutlets; style shortly surpassed by nutlets or reaching to their tips.—Pittonia i. 112 (1887). *Krynitzkia dumetorum* Greene in Gray, Proc. Am. Acad. xx. 272 (1885).

Deserts from western Nevada to Southern California.

NEVADA: Muddy Valley, 510 m. alt., *Kennedy & Goodding 74* (UC). CALIFORNIA: half climbing among bushes at Tehachapi Pass, 1884, *Curran* (G-TYPE); Kramer, *Parish 9810* (UC); Kramer, *K. Brandegee* (G, UC); Barstow, 1909, *K. Brandegee 158* (G, UC); Lancaster, *K. Brandegee* (UC); Whitewater, 300 m. alt., 1903, *Jones* (UC); without locality, *Lemmon* (UC).

An anomalous species very peculiar in habit and in calyx and nutlet developments. Although the tips of the 4 nutlets in each calyx are of equal height, their bases are decidedly not so. The base of the axial one is more developed than that of the others causing the axial side of the calyx to be gibbously distended downwards along the pedicel and thereby making the base of the calyx conspicuously oblique. In habit the species is unique in the genus. It commonly grows about bushes and scrambles up through them, often reaching a meter in height. So sinuous and brittle are the stems that it is commonly quite impossible to disentangle from the supporting bush a perfect specimen of this plant. The pedicels are unquestionably persistent, being as decidedly so as are those of *C. micrantha*. The type of the species is given as having come from Tehachapi Pass. An annotation in the University of California Herbarium gives the type-locality as: Tehachapi Pass, probably at the "Bend," between Mohave and Tehachapi Station.

15. **C. micromeres** (Gray) Greene. Slender usually erect-growing

herb 1–5 dm. tall; stems dull dark-green, short-hirsute throughout; leaves linear to oblong-linear, somewhat hirsute on both surfaces and usually somewhat pustulate beneath, 1.5–4.5 cm. long; spikes commonly ternate, very slender, naked, 2–8 cm. long; corolla inconspicuous, subtubular, ca. 0.5 mm. broad; fruiting calyces very small, 1–2 mm. long, subglobose, fulvous, sessile or nearly so, early deciduous; mature calyx-lobes ovate-lanceolate, decidedly connivent, scarcely surpassing the fruit, margins ciliate, midrib slightly thickened, hirsute and frequently uncinate; nutlets 4, heteromorphous, triangular-ovate, 0.7–0.9 mm. long, margin subangulate; odd nutlet slightly the largest, smooth or sparsely papillate, next the axial calyx-lobe; consimilar nutlets papillate, groove open, gradually dilated into a small open areola; gynobase equalled by consimilar nutlets but somewhat surpassed by odd one; style short, equalling or bearly surpassing the odd nutlet.—Pittonia i. 113 (1887). *Eritrichium micromeres* Gray, Proc. Am. Acad. xix. 90 (1883). *Krynitzkia micromeres* Gray, Proc. Am. Acad. xx. 274 (1885).

Central California to northwestern Lower California.

California: Ione, 1886, *K. Brandegee* (UC); near Mokelumne Hill, 1885, *Rattan 6* (G); Mokelumne Hill, *Blaisdell* (G); new Coulterville Road, Mariposa Co., 1897, *Congdon 42* (G); Tamalpais, 1910, *K. Brandegee* (UC); Antioch, 1889, *K. Brandegee* (UC); moist shaded ground, Cerritos Creek near Berkeley, *Tracy 761* (UC); Boswell's, Berkeley Hills, *Tracy 2074* (G); foothills west of Los Gatos, *Heller 7341* (G, UC); Glenwood, 1900, *Eastwood* (G); Ben Lomond, *K. Brandegee* (UC); Santa Cruz, *Jones* (G, type); seaside, Monterey, *Eastwood 162* (G); on the Salinas road near Del Monte, *Heller 6698* (UC); Point Sur, 1888, *K. Brandegee* (UC); Painted Cave Ranch, Santa Barbara Co., *Eastwood 66* (G, UC); Santa Inez Mts., 1888, *Brandegee* (G); Santa Cruz Island, 1888, *Brandegee* (UC); chaparral burn, La Jolla, *Clements 109* (G, UC); Point Loma, *Brandegee 1622* (G, UC); Point Loma, *Eastwood 2518* (G); Point Loma, 1906, *K. Brandegee* (UC). Lower California: near Ensenada, 1882, *Jones* (UC).

This species develops the smallest flowering and fruiting parts known in the genus. Its occurrence is sporadic, and in the south at least somewhat determined by the presence of chaparral-burns.

16. **C. maritima** Greene. Ascending loosely branched herb becoming 1–3 dm. tall; stems commonly reddish, strigose or frequently hirsute; leaves linear to lanceolate, acutish, usually somewhat contracted at the base, 1–3.5 cm. long, 1–4 mm. wide, commonly hirsute, coarsely pustulate; spikes solitary or geminate, 1–6 cm. long, usually more or less crowded and frequently glomerate, irregularly leafy-bracted throughout; corolla inconspicuous, tubular, 1.4–2 mm. long, 0.5–1 mm. broad; fruiting calyx 1.8–3(–3.5) mm. long, ovate-oblong, stiffly ascending, slightly asymmetrical, tardily deciduous, subsessile;

mature calyx-lobes lance-linear, stiff, connivent, midrib of three abaxial lobes thickened and hirsute, margins appressed short hispid-villous or loosely villous; ovules 2 or 4; nutlets 1–4, heteromorphous; odd nutlet frequently alone developing, smooth, shiny, brownish, oblong-lanceolate, 1–2 mm. long, firmly affixed, next the axial calyx-lobe, groove narrow or closed throughout or opening below into a small areola; consimilar nutlets grayish, minutely tuberculate, readily deciduous, slightly smaller but otherwise like odd nutlet; gynobase subulate, ½–⅔ length of nutlet; style about equalling the height of consimilar nutlets.—Pittonia i. 117 (1887).

Var. **genuina.** Ovules 2; nutlets 1 or 2; calyx not conspicuously pilose.—*Krynitzkia maritima* Greene, Bull. Calif. Acad. Sci. i. 204 (Aug. 1885). *C. maritima* Greene, Pittonia l. c.; Munz & Johnston, Bull. Torr. Bot. Cl. xlix. 38 (1922). *K. ramosissima* of Greene, Bull. Calif. Acad. Sci. i. 203 (Aug. 1885); not *K. ramosissima* Gray (Jan. 1885). *C. ramosissima* of most recent authors.

Nevada to Lower California.

California: Mohave Desert, 1884, *Curran* (G); dry sand hills near Barstow, 700 m. alt., *Spencer 1950* (G); Maillard Canyon near Barstow, 700 m. alt., *Spencer 2088* (G); gravelly hillsides 17.6 km. west of Needles, 210 m. alt., *Munz & Harwood 3611* (UC); Needles, *Jones 3824* (G); desert sand, mouth of Tahquitz Canyon, 180 m. alt., *Spencer 1523* (G); sandy places near Palm Springs, 120 m. alt., *Spencer 1528, 2067, 2068* and *2071a* (G); rocks near Indian Wells, 8 m. alt., *Spencer 1520* (G); sandy places, Schaffer's Canyon near Mecca, 48 m. below sea-level, *Spencer 2069* (G) and *Munz & Keck 4755* (G); Signal Mt., *Abrams 3177* (G); Mason's, Colorado Desert, 1899, *Brandegee* (UC); in sand, Colorado Desert, *Spencer 195a* and *198* (G); Colorado Desert, 1890, *Wright* (UC); Point Loma, 1884, *Orcutt* (G, UC); windswept arroyos, San Nicolas Island, *Trask 56* and *57* (G); Santa Barbara Island, *Trask* (UC); Catalina Island, 1884, *Lyon* (G); Catalina Island, 1890, *Brandegee* (UC). Lower California: northern Lower California, *Orcutt 2257* (UC); Lagoon Head, *Palmer 781* (G, UC); Guadalupe Island, *Palmer 879* (G), *Anthony 241* (G, UC), *Palmer 67* (G), *Greene* in 1885 (G, UC, isotypes of *K. maritima*), *Anthony* in 1896 (UC), *Brandegee* in 1897 (UC); San Benito Island, *Palmer 912* (G), *Pond 21* (G), *Anthony 276* (UC), *Brandegee* in 1897 (UC); Natividad Island, 1897, *Brandegee* (UC); Santa Margarita Island, 1889, *Brandegee* (UC).

Var. **cedrosensis** (Greene), comb. nov. Ovules 4; nutlets 1–4; otherwise as in preceeding variety.—*Krynitzkia cedrosensis* Greene, Bull. Calif. Acad. Sci. i. 204 (1885). *C. cedrosensis* Greene Pittonia i. 117 (1887); Brandg. Bot. Gaz. xxvii. 454 (1899).

Endemic to Cedros Island.

Lower California: Cedros Island, *Palmer 691* (G), *Greene* in 1885 (G, UC, isotypes), *Veatch* (G), *Anthony 289* (G, UC).

Var. **pilosa** Johnston. Ovules 2; nutlets 1 or 2; calyx conspicu-

ously clothed with long white villous pubescence.—Univ. Calif. Pub. Bot. vii. 445 (1922).

Nevada to Lower California, occurring with var. *genuina* but less common.

NEVADA: Logan, 1909, *Kennedy* (UC). CALIFORNIA: Death Valley, *Coville & Funston 480* (G); Furnace Creek, *Parish 10005* and *10050* (UC); Calico, *Parish 9798* (UC); Inyo County, *Rixford* (UC); Kane Springs, Ord Mts., *Hall & Chandler 6807* (UC); Needles, 1884, *Lemmon* (UC); Signal Mt., 1901, *Brandegee* (UC). ARIZONA: Tempe, 1892, *Ganong & Blaschka* (G). LOWER CALIFORNIA: stony ridges, Los Angeles Bay, *Palmer 551* (UC, TYPE; G, ISOTYPE); Santa Agueda, *Palmer 2142* (UC).

A well defined and common species in the Californian deserts and on the coastal islands. The usual form is readily recognized by being biovulate and having reddish strigose stems. It has generally gone as *C. ramosissima* but that name being based on a renaming of *C. racemosa* properly falls into synonymy.

Ser. V. PTEROCARYAE. Nutlets 1–4, tuberculate or papillate or verrucose, lanceolate, with knife-like or conspicuously winged sides, homomorphous or frequently heteromorphous and with the odd nutlet (sometimes alone developing) axial and usually lacking a thin margin; style reaching to tip of nutlet-body or definitely beyond.

Nutlets solitary or rarely 2, usually with a knife-like margin; calyx obliquely conical at ba e.....17. *C. utahensis.*
Nutlets 4; calyx symmetrical.
  Corolla conspicuous; mature calyx obviously longer than broad; nutlets always homomorphous.....18. *C. oxygona.*
  Corolla inconspicuous; mature calyx nearly as broad as long; axial nutlet frequently wingless.....19. *C. pterocarya.*

17. **C. utahensis** (Gray) Greene. Erectly branched herb 1–3 dm. high; stems closely strigose or more or less appressed short-hirsute; leaves not numerous, strongly reduced above, linear to oblance-linear, 1-5(–7) cm long, 1–4 mm. wide, rounded at apex, commonly pustulate and short-hirsute especially beneath; spikes geminate or sometimes solitary, commonly 0.8–2.5(–5) cm. long, dense, naked; corolla evident, 2–3 mm. broad; fruiting calyces ovate or ovate-oblong, 2–3(–4) mm. long, quite asymmetrical, subsessile by a broadly conic oblique base, spreading or somewhat recurved, deciduous, usually densely appressed-hirsute and notably silky; mature calyx-lobes lanceolate, strongly connivent, midrib thick and usually brownish and infrequently bearing spreading or recurved hairs; ovules 4; nutlets 1 or rarely 2, next the abaxial calyx-lobe, 1.7–2.5 mm. long, 1–1.5 mm. broad, pale, broadly lanceolate, granulate, muricate-

papillate or rarely spinulose, back low-convex or flat, margins sharp-angled or with a very narrow knife-like margin; groove open, narrow, opening into a small areola below; gynobase subulate, ca. ⅔ height of nutlet, not markedly differentiated from style; style usually a trifle shorter than the nutlet.—Pittonia i. 120 (1887). *Krynitzkia utahensis* Gray, Synop. Fl. N. Am. ii. pt. 1, Suppl. 427 (1886). *Eritrichium holopterum*, var. *submolle* Gray, Proc. Am. Acad. xiii. 374 (1878). *C. submollis* Cov. Contr. U. S. Nat. Herb. iv. 166 (1893).

Southern Utah and western Arizona and westward into the deserts of California.

UTAH: volcanic rocks and ashes, Diamond Valley, *Goodding 828* (G, UC); St. George, *Palmer 352* (G, TYPE). ARIZONA: Yucca, *Jones* (G); Yucca, *Jones 3910* (UC). NEVADA: Candelaria, *Shockley 347* (G) and *650* (UC); foot of cliffs, Meadow Valley Wash, *Goodding 2165* in pt. (G); rocky slopes, Mesquite Well, *Goodding 2252* (G); Rhyolite, 1080 m. alt., *Shockley 69* (UC); Gold Mt., *Purpus 5986* (UC). CALIFORNIA: Inyo County, 1891, *Brandegee* (UC); Surprise Canyon, Panamint Mts., 800 m. alt., *Coville & Funston 714* (G); without locality, *Purpus 5433* (G); Providence Mts., *Munz, Johnston & Harwood 4241* (UC); Daggett, 1914, *K. Brandegee* (UC); sandy places near Barstow, *Spencer 2082* and *2093* (G); in sandy places, Palm Springs, *Spencer 1526, 2073, 2074, 2075* and *2076* (G); in sandy places, Mission Canyon, 180 m. alt., *Spencer 1782* (G); Colorado Desert, 1889, *Orcutt* (UC).

A very neat species most readily distinguished by the appressed silky indument on the calyx. It seems to be an ally of *C. pterocarya*. Its rough nutlets at once distinguish it from *C. gracilis* and *C. Watsoni* with which it has been frequently confused.

18. **C. oxygona** (Gray) Greene. Sparsely branched herb 1–4 dm. tall; stems usually solitary with several well-developed ascending branches from near base, appressed villous-hispid or strigose, often sparsely hispid, leaves linear or lance-linear, 1–4(–6) cm. long, 1–2(–3) mm. broad, strigose or short-hispid, ascending, obtusish, densely and inconspicuously pustulate, upper ones evidently reduced; spikes geminate or ternate, usually short and dense, 1–3(–6) cm. long, naked; corolla conspicuous, limb 4–7 mm. broad; fruiting calyces ovate or oblong-ovate, ascending, 2.5–4 mm. long, deciduous, obscurely biserial, symmetrical, base rounded, pedicel ca. 0.5 mm. long; mature calyx-lobes lanceolate, somewhat connivent above, margin more or less silky-strigose, midrib slightly thickened and frequently sparsely hirsute; nutlets 4, homomorphous; body of nutlets oblong-ovate, 2 or rarely 3 mm. long, only slightly shorter than the calyx-lobes, muricate or tuberculate, back low convex; margin of nutlet narrowly winged or knife-like; groove closed or rarely open, broadly forked below where always opened to form a triangular areola; gynobase columnar-

subulate, about ⅔ height of nutlets; style clearly surpassing the nutlets.—Pittonia i. 120 (1887). *Eritrichium oxygonum* Gray, Proc. Am. Acad. xix. 89 (1883). *Krynitzkia oxygona* Gray, Proc. Am. Acad. xx. 277 (1885).

Borders of the San Joaquin Valley and southward along the desert margins to the northern end of the Colorado Desert.

California: Alcalde, 1892, *Brandegee* (UC); Estrella, 1897, *Jared* (UC); open places in rich ground, McKittrick, *Heller 7789* (G, UC); northern slope of Tehachapi, 1905, *K. Brandegee* (UC); Tehachapi, *K. Brandegee* (G, UC); hills bordering the Mohave Desert, 1882, *Pringle* (G, TYPE); mountain slopes, San Bernardino Co., 1200 m. alt., *Spencer 415* (G); without locality, *McLean* (UC); near Minerets, Madera Co., 1899. *Congdon* (UC); hillsides, Erskin Creek, *Purpus 5369* (G, UC); Deep Spring, *Purpus 5825a* (UC); Coyote Canyon, 150 m. alt., *Hall 2849* (UC); between San Jacinto and El Toro Mts. at Van Deventer Ranch, 1350 m. alt., *Hall 1161* (UC). Nevada: Palmetto Range, *Purpus 5897* in part (UC).

This species, although having the gross habit of *C. muricata*, is clearly related to *C. pterocarya* and particularly to the variety *cycloptera*. In fact, decisive characters for separating the two species appear to be lacking. As a general rule, however, *C. oxygona* differs in having conspicuous corollas, narrower usually more silky calyces, and brownish nutlets rarely if ever with scolloped or lobed wings. It is maintained as a species largely because of its natural range, which, generally speaking, is apart from that of *C. pterocarya*. The most satisfactory character for separating *C. oxygona* from *C. pterocarya* seems to be corolla-size. It is significant, however, that a specimen (*Purpus 5715a*) from the South Fork of the Kern River, occurring within the range of *C. oxygona* and having the characteristic habit, calyx and nutlets of that species, nevertheless has minute corollas. For practical purposes this specimen has been refered to *C. pterocarya*.

19. **C. pterocarya** (Torr.) Greene. Erect ascendingly branched herb 1–5 dm. high, finely strigose or short-hirsute; leaves broadly linear or the reduced, upper ones somewhat lanceolate, 1–2.5(–4) cm. long, 1–3(–5) mm. broad, obtuse, strigose or hispid, coarsely pustulate below but usually finely so above, spikes geminate or rarely ternate or solitary, naked or inconspicuously bracted below, 2–6(–12) cm. long, becoming loosely flowered; corolla inconspicuous, 0.5–1(–2) mm. broad; fruiting calyces becoming notably accrescent, usually broadly ovate, (2–)3–5 mm. long and usually about ¾ as broad, tardily deciduous, symmetrical, base obtuse or rounded, pedicels 0.5–1 mm. long; mature calyx-lobes ovate to lanceolate, connivent, only a little surpassing the nutlets, margins more or less tawny appressed-hispid, midrib slightly thickened and weakly and sparsely hispid; nutlets 4,

homomorphous and all winged, or heteromorphous with axial nutlet wingless; body of nutlet oblong-lanceolate or lanceolate, 2–2.5(–3) mm. long, muricate or verrucose; wing-margin of nutlet broad or narrow, entire or crenate or lobed, extending completely around the nutlet or only down the sides; groove open or closed (even in the same plant) and dilated below into an open excavated areola; gynobase slender, about ⅔ height of nutlets; style subulate, slightly surpassing or somewhat surpassed by the wing-margin of the nutlets but always exceeding the body proper.—Pittonia i. 120 (1887).

Var. **genuina.** Nutlets heteromorphous, axial one wingless.—*Eritrichium pterocaryum* Torr. Bot. Mex. Bound. 142 (1859); Bot. Wilkes Exped. 415, t. 13 (1873). *Krynitzkia pterocarya* Gray, Proc. Am. Acad. xx. 276 (1885). *C. pterocarya* Greene, l. c. *E. pterocaryum*, var. *pectinatum* Gray, Proc. Am. Acad. x. 61 (1874). *K. pterocarya*, var. *pectinata* Gray, Proc. Am. Acad. xx. 276 (1885). *C. pectocarya* Frye & Rigg, Northwest Fl. 328 (1912).

Eastern Washington and southern Idaho and southward to Southern California and Utah. Sporadic in Arizona.

Washington: junction of Crab and Wilson creeks, *Sandberg & Leiberg 260* (G, UC); in sand, Pasco, *Piper 2961* (G); Walla Walla, *Brandegee 995* (G, UC) and *994* (UC); rocky bank of Columbia River near Columbus, *Suskdorf 889* (UC); without locality, *Vasey 421* (G). Oregon: clay bank, Mathew Butte, 750 m. alt., *Leiberg 2041* (G, UC); near Lexington, 400 m. alt., *Leiberg 41* (G, UC). Idaho: dry open slope, Castleford, *Nelson & Macbride 1739* (G). Utah: St. George, 1880, *Jones* (UC); southern Utah, 1873, *Bishop* (G); Stansbury Island, *Watson 859* (G). Nevada: Peavine Hills, 1895, *Hillman* (UC); Pyramid Lake, *Kennedy 998* (UC); Truckee Lake, *Kennedy 1345* (UC); Lawton's Springs, 1894, *Hillman* (UC); Reno, 1890, *Hillman* (UC); Reno, 1884, *Curran* (UC); Reno, 1885, *K. Brandegee* (UC); about Carson City, 1446 m. alt., *Baker 975* (G, UC); Carson City, *Watson 859* (G); Carson City, *Anderson 165* (G); Candelaria, *Shockley 282* (UC); ravine among hills near Mina, *Heller 8365* (G); on scoria on mesa west of Goldfield, *Heller 10971* (G); Gold Mt., *Purpus 5986* (UC); boulder slopes, Moapa, *Goodding 2202* (G, UC); Indian Spring, Clarke Co., 1020 m. alt., *Tidestrom 9026* (G); foot of cliff, Meadow Valley, *Goodding 2165* in pt. (G); stony hillsides, Meadow Valley Wash, *Goodding 974* (G). Arizona: near Needles, 1886, *Clark* (UC); Yucca, *Jones 3906* (UC); near Camp Lowell, *Pringle 366* in pt. (G). California: Honey Lake, 1892, *Brandegee* (UC); Sierra County, *Lemmon* (G); foothills west of Bishop, *Heller 8275* (G); Andrews Camp, Bishop Creek, *Davidson 2698* (G); Andrews Camp near Bishop, *K. Brandegee* (UC); McGee's Meadow near Bishop, *K. Brandegee* (UC); sandhills west of Laws, *Heller 8205* (G); sand, Kramer, *Heller 7668* (G, UC); Keeler, 1891, *Brandegee* (UC); Barnwell, *K. Brandegee* (UC); Leastalk, *Parish 10238* (UC); Granite Wells, *Parish 10138* (UC) and *Johnston 6494* (UC); sand near Barstow, *Spencer 2084* (G); Ord Mts., *Hall & Chandler 6803* (UC); Acton, *Elmer 3716* (G); Descanso, *K. Brandegee* (G, UC).

Var. **cycloptera** (Greene) Macbr. Nutlets homomorphous, all winged.—Contr. Gray Herb. n. s. xlviii. 44 (1916). *Krynitzkia*

cycloptera Greene, Bull. Calif. Acad. Sci. i. 207 (1884). *C. cycloptera* Greene, Pittonia i. 120 (1887).

Southern California to western Texas and sporadic in southern Nevada and Utah and in eastern Colorado.

California: Inyo, 1891, *Brandegee* (UC); Surprise Canyon, Panamint Mts., 800 m. alt., *Coville & Funston 720* (G); Ord Mts., *Hall & Chandler 6807a* (UC); rocky places, Snow Creek near Palm Springs, 150 m. alt., *Spencer 2065a* (G); desert sand, Palm Springs, 135 m. alt., *Spencer 846* and *847* (G); rocky places, Cathedral Canyon near Palm Springs, 120 m. alt., *Spencer 2079* (G); Coyote Canyon, 150 m. alt., *Hall 2839* (UC); desert sand, Mountain Springs, *Spencer 200* and *856* (G); San Felipe, 1895, *Brandegee* (UC); Colorado Desert, 1896, *Brandegee* (UC); Colorado Desert, *Wright 1764* and *1770* (UC); Colorado Desert, *Spencer 190* (G). Nevada: sandy places, Charleston Mts., *Purpus 5825* (UC); shade of rocks, Muddy Range, *Goodding 2227* (G); Muddy Valley, *Kennedy & Goodding 24* (UC). Arizona: Diamond Creek Canyon, 1893, *Wilson* (UC); northern Arizona, 1893, *Wilson* (UC); Verde River, *Smart 132* (G); hills near Tucson, 1884, *Pringle* (G, isotype); Tucson, 1894, *Toumey* (UC); Rio Cienega, *Greene 1111* (G); Nogales, 1892, *Brandegee* (UC); Lowell, *Parish 167* (G); Fort Whipple, *Palmer 346* (G). Colorado: Grand Junction, 1892, *Eastwood* (G). New Mexico: rocky hillsides, south end of Black Range, 1380 m. alt., *Metcalfe 1573* (G). Texas: El Paso, *Jones 3753* (UC); Fronteras, *Wright 1570* (G).

This is one of the most interesting species in the genus. Its conspicuously winged nutlets and broad large fruiting calyces are very distinctive. Although for the most part readily determined, it has some forms that are very puzzling. The outstanding variation is the well understood one regarding nutlet-form. As a general rule, the northern material has heteromorphous nutlets, whereas the southern has them homomorphous. Actual intergrades connecting the two forms are rare. In these the axial nutlet is frequently smallest and is more narrowly and less completely winged than the others. The northern plant with heteromorphous nutlets has been commonly taken as the typical form. The specific name was first published in the Mexican Boundary Report. The few notes there given clearly apply to the southern homomorphous form. From internal evidence, however, it is very clear that the Mexican Boundary Report was written subsequently to the Botany of the Wilkes Expedition. Hence the much later publication in the Wilkes Report is primarily considered in typifying the species, especially since in that work the plant was illustrated and fully described. The material from Walla Walla, Washington, collected by Pickering & Brackenridge and illustrated by Torrey is accordingly taken as the type. This material has heteromorphous nutlets. The southern plant with homomorphous nutlets was named *C. cycloptera* by Greene and was subsequently reduced to a variety of *C. pterocarya* by Macbride. It is possible that the

varietal name *pectinata* should be taken up in place of var. *cycloptera*. Gray originally published it as *Eritrichium pterocaryum*, var. *pectinatum*, basing it upon material collected by Parry (numbers *168* and *169*) in the Virgin River Valley near St. George, Utah. Unfortunately, however, Gray hastily mounted collections by Greene and by Palmer on the type sheet of the var. *pectinatum* and it is now quite impossible to decide just which are the original Parry collections. Since both var. *genuina* and var. *cycloptera* are represented on the mixed sheet it seems best to drop the varietal name *pectinatum* as a *nomen confusum*, particularly so since the lobing of the nutlet-wing seems to be too hopelessly variable and unimportant to justify nomenclatorial recognition.

The most puzzling forms of *C. pterocarya* come from southern Nevada and Southern California. Purpus has collected material in the Gold Mountains of Nevada which have very small, scarcely accrescent calyces and a habit suggesting that of *C. utahensis* or *C. gracilis*. The nutlets, though small, are quite like those of typical *C. pterocarya* and it seems best to refer the specimens to that group.

A specimen collected by Munz (number *5746*) above Cactus Flats in the San Bernardino Mts. of California, although clearly related to *C. pterocarya*, may represent an unnamed species. The calyces are rather small and quite hirsute, although with the characteristic broad form of *C. pterocarya*. The nutlets are heteromorphous, but instead of having the odd nutlet wingless, it is winged and the consimilar nutlets are wingless and suggest those of *C. utahensis*. More material of this peculiar variation is greatly desired.

I doubtfully refer to the var. *cycloptera* a collection made by Purpus (number *5715a*) in the South Fork of the Kern River. The specimen has the habit of *C. holoptera*, in fact appears to differ from thoroughly typical members of that species only in having inconspicuous corollas. Since flower-size seems to be the only character capable of separating *C. holoptera* and *C. pterocarya* in a manner that is at all practical and satisfying, I am arbitrarily referring Purpus's collection to *C. pterocarya* although it is realized that in range and habit it unmistakably suggests *C. holoptera*.

Ser. VI. TEXANAE. Nutlets 1–4, tuberculate or papillate, ovate to lanceolate or oblong, with obtuse or rounded sides, decidedly heteromorphous with the odd nutlet (sometimes the only one developing) axial, larger than and usually roughened very differently from the others; style surpassed by odd nutlet.

Nutlets smooth or nearly so.....20. *C. Pattersoni.*
Nutlets coarsely granulate or tuberculate.
Nutlet 1, axial one alone developing; ascendingly branched, usually 2–4 dm. tall.....21. *C. texana.*
Nutlets 4; spreading, usually 1–1.5 dm. tall.
Consimilar nutlets lance-ovate, acuminate, 1.8–2.3 mm. long; areola small and suprabasal; calyx-lobes only moderately thickened.....22. *C. Kelseyana.*
Consimilar nutlets ovate or oblong, acute, ca. 1.5 mm. long; areola large and ventral; calyx-lobes conspicuously thickened, hard.
Spikes bracteate throughout; odd nutlet papillate-granulate.....23. *C. minima.*
Spikes naked; odd nutlet finely granulate and spinular-muricate.....24. *C. crassisepala.*

20. **C. Pattersoni** (Gray) Greene. Loosely branched hirsute herb 1–1.5 dm. high; stems usually several, ascending, branched, hirsute and usually somewhat strigose; leaves oblanceolate 1–3 cm. long, 2–4 mm. wide, rather firm, obtuse, hirsute, more or less pustulate, upper ones little reduced; spikes solitary or geminate, naked, 2–5(–7) cm. long; corolla inconspicuous, 1–1.5 mm. broad; fruiting calyx oblong-ovate, 4–5 mm. long, spreading, slightly asymmetrical, evidently biserial, lowermost becoming 2–6 mm. distant; pedicels ca. 0.5 mm. long; mature calyx-lobes linear-lanceolate, tips more or less connivent, midrib thickened and hirsute, margins appressed hispid; nutlets 4, heteromorphous; odd nutlet next axial calyx-lobe, slightly the largest, ca. 1.9 mm. long, ovate, acute, smooth or obscurely rugulose or sparsely tuberculate, somewhat persistent, standing off slightly from the gynobase; consimilar nutlets oblong-ovate, ca. 1.6 mm. long, deciduous, closely appressed to gynobase, smooth, back convex, sides rounded or obtuse, groove opened or closed and abruptly broadening below into a small triangular areola; gynobase narrow, reaching to ca. ⅔ height of consimilar nutlets; style exceeded by odd nutlet, equalling or a little shorter than consimilar nutlets.—Pittonia i. 120 (1887). *Krynitzkia Pattersoni* Gray, Proc. Am. Acad. xx. 268 (1885).

Mountains of Colorado and Wyoming. Rarely collected.

WYOMING: very dry sandy soil, 32 km. east of Point of Rocks, *Payson 2546* (G); on dry roadsides, Junction Butte, *Nelson 5887* (G). COLORADO: Kremling, *Osterhout 3464* (G); Sulphur Springs, *Osterhout 3559b* (G); without locality, 1875, *Patterson* (G, TYPE); without locality, 1877, *Hooker & Gray.*

This species is related to *C. Kelseyana* and *C. ambigua* and seems to intergrade with both. In habit it is quite like *C. ambigua*, and with immature material alone available it is scarcely possible to distinguish

it from that species. The most troublesome intergrades come from northwestern Wyoming. Certain material from this region has the nutlet next the axillary calyx-lobe slightly more persistent and more erect than the others, and hence suggesting a relationship with *C. Pattersoni*. Despite these suggestive developments the specimens are referred to *C. ambigua*, since for all practical purposes the nutlets are similar in size and shape, and usually indistinguishable in markings and hence quite like those of *C. ambigua*.

The type of *C. Pattersoni* probably came from the Rocky Mountains near Golden, Colorado. The species appears to occur at altitudes somewhat higher than those affected by *C. Kelseyana* and *C. minima*.

21. **C. texana** (A. DC.) Greene. Ascendingly branched hirsute herb 1.5–4 dm. high; stems usually several, with few short branches; leaves oblanceolate 2–5(–7) cm. long, 2–5(–8) mm. wide, obtuse or rounded, not particularly firm, uppermost little reduced; spikes solitary or occasionally geminate or ternate, naked or at times sparsely bracted at base, 4–7(–11) cm. long, not sharply differentiated from leafy mass of plant; corolla inconspicuous, ca. 1 mm. broad; fruiting calyces ovate-oblong, 4–5 mm. long, somewhat asymmetrical, widely spreading or subdeflexed, becoming remote; pedicels short but evident, 0.5–1 mm. long; mature calyx-lobes lance-linear, more or less connivent with the herbaceous tips spreading, midrib indurated and strongly hirsute, margin sparsely short-hispid; ovules 4, only the one next the axial calyx-lobe maturing; nutlet solitary, persistent, broadly ovate, acute, ca. 2 mm. long, pale, densely and evenly coarse-granulate, back convex, sides rounded; gynobase short-oblong, ⅓–¼ as long as the style; style reaching to above the middle of the nutlet.—Pittonia i. 112 (1887). *Eritrichium texanum* A. DC. Prodr. x. 130 (1846). *Myosotis texanae* Hook. Kew Jour. Bot. iii. 295 (1851). *Krynitzkia texana* Gray, Proc. Am. Acad. xx. 268 (1885).

Central and western Texas.

Texas: Llano County, 1885, *Reverchon* (G); dry ground, Austin, *Hall 469* (G); valleys among hills beyond Limpia Pass, *Wright 488* (G); without locality, *Drummond* (G, UC, isotypes); without locality, *Wright* (G).

Evidently related to *C. crassisepala* but quite distinct, since it differs in its more restricted easterly range, looser and taller habit of growth, and coarsely granulate solitary nutlets. Although *C. texana* has four ovules only one nutlet develops, that being the one next the axial calyx-lobe and clearly the homologue of the odd nutlet in *C. crassisepala*. The type of *C. texana* was collected by Drummond probably in the vicinity of Austin.

22. **C. Kelseyana** Greene. Spreading or ascending hirsute herb 5–25 cm. high; stems one to several, hirsute and also hispid-strigose; leaves 1.5–3(–4) cm. long, 2–4 mm. wide, rounded or obtuse, thickish, linear-oblanceolate, hirsute, pustulate, the upper ones scarcely reduced; spikes usually solitary, 4–9 cm. long, naked or with a few bracts near base; corolla inconspicuous, 1–2 mm. broad; fruiting calyx 4–6 mm. long, ovate-oblong, spreading, somewhat asymmetrical, loose or dense; pedicels short but definite, ca. 0.8 mm. long; mature calyx-lobes linear, slightly connivent above, midrib thickened and hirsute, margins inconspicuously villous-strigose; nutlets 4, heteromorphous; odd nutlet next the axillary calyx-lobe, broadly lance-ovate, 2–2.6 mm. long, smoothish or granulate or granulate-muriculate or rarely somewhat tuberculate, standing off slightly from the gynobase; consimilar nutlets lance- or oblong-ovate, 1.8–2.3 mm. long, coarsely tuberculate and commonly granulate, darker than odd nutlet, sides rounded; groove narrow or closed, near base abruptly dilated to form a small triangular areola; gynobase subulate, a little longer than style, ½–⅔ height of consimilar nutlets; style surpassed by odd nutlet and just surpassing or even exceeded by consimilar ones.—Pittonia ii. 232 (1892); Macbr. Contr. Gray Herb. n. s. xlviii. 49 (1916).

Saskatchewan and Montana southward through Wyoming to northern Colorado and Utah.

Saskatchewan: Medicine Hat, *Macoun 5803* in pt. (G); without locality, 1858, *Bourgeau* (G). Montana: scratch gravel near Helena, 1898, *Brandegee 26* (UC); Boulder Desert, 1898, *Brandegee 36* (UC); Elliston, Aug. 1889, *Greene* (G. isotype); Northern Boundary, French Creek to Rocky Mts., 1874, *Coues* (G). Wyoming: Teton National Forest, 1897, *Brandegee* (UC); snow-drift beds, Powder River, *Nelson 9377a* and *9415* (G); C. Y. Horse Ranch, Natroma Co., *Goodding 234* (G); open woods near the river, Ft. Steele, *Nelson 9049* (G); waste ground, Bates Creek, *Goodding 197* (G); sandy plains, Laramie, *Nelson 3171* and *7280* (G, UC); under ledges, Cow Creek, *Nelson 8897* (G, UC); Pole Creek, *Nelson 1335* (G, UC); Laramie Hills, *Nelson 412* (G); Sherman, 1893, *Greene* (UC); Gorfield Peak, *Nelson 672* in pt. (UC); sandy roadside 5 km. north of Saratoga, *Payson 2535* (G). Utah: deep sand, Ogden, *Goodding 1176* (G). Colorado: Kremling, *Osterhout 3464* (G); mountain side near Georgetown, 1885, *Patterson* (G, UC); Castle Rock in foothills near Golden, *Patterson 111* (G); west of Craig, *Osterhout 6188* (G); Rocky Mts., lat. 40°–41°, *Vasey 434* (G).

This plant has been often confused with *C. crassisepala* although quite distinct in range and in structures. It is a larger more loosely branched plant with more elongate less indurated calyx-lobes, narrower ventrally less excavated nutlets, and a range separated from true *C. crassisepala* by half the width of Colorado and Utah. Although frequently growing with *C. minima* it is at once separable by its ebracteate inflorescence and very different nutlets.

23. **C. minima** Rydb. Erect or widely spreading hirsute herb 1–1.5(–2) dm. high; stems usually numerous, branched, finely strigose and coarsely hirsute; leaves oblanceolate, thickish, 1–3 cm. long, 2–4 (–5) mm. broad, obtuse or rounded, hispid or hirsute and usually pustulate, upper ones little reduced and continuing through inflorescence as evident foliaceous bracts; spikes solitary or rarely geminate, bracted, 2–8(–15) cm. long, frequently springing from even the lowest axils; corolla inconspicuous, 1–1.5 mm. broad; fruiting calyces oblong-ovate, 5–7(–9) mm. long, spreading, asymmetrical; pedicels short but definite, 0.5–1.2 mm. long; mature calyx-lobes linear-lanceolate, connivent above, midrib hirsute and strongly indurated and thickened, margins sparsely appressed-hispid; nutlets 4, heteromorphous; odd nutlet persistent, next the axial calyx-lobe, 2–3 mm. long, brownish, very finely and closely papillate-granulate, ovate, acute; consimilar nutlets 1.2–1.5 mm. long, ovate, thickish, strongly tuberculate, not granulate; groove broadly dilated at least to beyond middle, commonly excavated, not forked; gynobase oblong, slightly more than ½ length of consimilar nutlets; style evidently surpassed by odd nutlet, equalling or surpassing consimilar nutlets.—Bull. Torr. Bot. Cl. xxviii. 31 (1901).

Plains east of continental divide from Saskatchewan southward to northern Texas; occuring west of the mountains only in southwestern Colorado.

Saskatchawan: Medicine Hat, *Macoun 5803* in pt. (G). Montana: Great Falls, 1887, *Anderson* (UC). Wyoming: Blue Grass Hills, *Nelson 304* (G, UC). Colorado: Castle Rock near Golden, 1800 m. alt., *Patterson 111* in pt. (G); near Golden, *Greene 301* (G); Ft. Collins, 1896, *Crandall* (UC); lat. 39°–41°, *Hall & Harbour 433* and *434* (G); 10 km. north of Pueblo, *Johnston & Hedgcock 509* (G); Canyon City, *Brandegee 406* (G, UC); Cuchara River, above La Veta, 2100 m. alt., *Rydberg & Vreeland 5697* (NY, type); dry adobe flats and foothills, Paradox, 1620 m. alt., *Walker 155* (G); dry hillsides, Naturita, 1620 m. alt., *Payson 296* (G); without locality, 1842, *Fremont* (G). South Dakota: Bad Lands, 1881, *Hatcher* (UC). Nebraska: Kennedy, 1890, *Bates* (G); Callaway, 1901, *Bates* (G); Harrison, 1890, *Bates* (G); top of butte, Ft. Robinson, 1200 m. alt., *Bessey 1* (G). Kansas: Ellis, 1876, *Watson* (G); plains, Ellis, *Hitchcock 346* (G). Oklahoma: low waste place, Waynoka, *Stevens 598* (G); sandy waste places, Alva, *Stevens 245, 616, 664* and *3040* (G); waste place, Shattuck, *Clifton 3083* and *3139* (G); waste place, Hornbeck's, *Stevens 282* (G). Texas: sandy plains, upper Colorado, *Reverchon 2120* (G); Big Wichita, 1880, *Ball* (G).

Although a very readily recognized species, *C. minima* has not been distinguished from its southerly ranging relative, *C. crassisepala*. *Cryptantha minima* has thick, hardened calyx-lobes and a gross habit very similar to that possessed by *C. crassisepala*, but differs very sharply in having definitely bracted inflorescences and in the fact that

the odd nutlet is simply papillate-granulate rather than covered with spiculate murications. The ranges of *C. minima* and *C. crassisepala* overlap only in southwestern Colorado. In the northern part of its range *C. minima* grows with *C. Kelseyana*, and, strange to say, has been frequently confused with it, although *C. minima* can at once be separated by its stockier nutlets with larger areolae, and, of course, by its bracteate inflorescence.

The name *C. minima* was originally proposed to cover certain material thought to be related to *C. pusilla*. An examination of the type, however, shows clearly that it is a very reduced form of the species here treated, and that though inappropriate, it is the name to be taken up for the bracteate material from the Great Plains until now passing as *C. crassisepala*.

24. **C. crassisepala** (T. & G.) Greene. Erect or widely spreading herb 5–15 cm. high; stems commonly numerous, loosely ascending, branched, hirsute or rarely hispid; leaves oblanceolate, 2–3(–6) cm. long, 3–4(–6) mm. wide, rounded or obtuse, thickish, hirsute, pustulate, the upper scarcely reduced; spikes solitary or rarely geminate, naked or few-bracted below, 5–8(–15) cm. long, frequently produced from the lowest axils; corolla inconspicuous, 1–1.5 mm. wide: fruiting calyces 6–7(–10) mm. long, oblong-ovate, somewhat asymmetrical, becoming distant below; mature calyx-lobes linear-lanceolate, connivent above, midrib very hirsute and strongly thickened and indurated, margins inconspicuously short-hispid; pedicels short but definite, 0.5–1.2 mm. long; nutlets 4 (1 or 2 rarely aborted), decidedly heteromorphous; odd nutlet next the axial calyx-lobe, persistent, 2–2.5(–3) mm. long, brownish, ovate, acute, finely granulate and spinular-muricate; consimilar nutlets readily deciduous, 1.2–1.5(–2) mm. long, oblong-ovate, thickish, coarsely tuberculate, very obscurely if at all granulate, groove usually dilated and commonly excavated to form an areola occupying much of the ventral face of the nutlet; gynobase narrowly oblong, usually about ⅔ height of consimilar nutlets; style equalling or a trifle exceeding the consimilar nutlets, surpassed by odd nutlet.—Pittonia i. 112 (1887). *Eritrichium crassisepalum* T. & G. Pacif. R. R. Rep. ii. pt. 4, 171 (1855). *Krynitzkia crassisepala* Gray, Proc. Am. Acad. xx. 268 (1885). *C. dicarpa* Nels, Proc. Biol. Soc. Wash. xvi. 30 (1903).

Southwestern Colorado and southern Utah southward to western Texas, Arizona and adjacent Mexico.

COLORADO: Deer Run, Gunnison Watershed, 1380 m. alt., *Baker 75* (G); Grand Junction, 1892, *Eastwood* (G, UC); dry sandy flat, Grand Junction,

Macbride & Payson 689 (G). UTAH: Cisco, 1890, *Jones* (G, UC); Price, 1895, *Stokes* (UC); Green River, 1890, *Jones* (UC). NEW MEXICO: Ft. Wingah, *Mathews 40* (G); Gila River bottom near Cliff, 1350 m. alt., *Metcalfe 52* (G, UC); Santa Fe, *Fendler 640* (G); Hueco Mts., *Thurber 61* (G); Albuquerque, *Jones 3709* (UC); mesa west of Organ Mts., 1200 m. alt., 1905, *Wooton* (G, UC); Silver City, *Eastwood 8401* (G). ARIZONA: Camp Lowell, 1883, *Pringle* (UC); Chino Valley, *Tuomey 240a* (UC); Clifton, *Davidson 501a* (UC); Aztec Ruins, Little Colorado, 1905, *Purpus* (UC); Verde Mesa, *Smart 141* (G); Douglas, 1200 m. alt., *Goodding 2273* (G, UC); Tucson, 1907, *Loyd* (G); Bernardino, 1902, *Orcutt* (UC); without locality, 1882, *Pringle* (UC). TEXAS: vicinity of permanent camp on Rio Pecos, April 6–7, 1856, *Pope Exped.* (G, ISOTYPE?); abundant on sandy hills northeast of El Paso, *Hanson 402* (G, NY); western Texas, March 9th, *Wright* (G). CHIHUAHUA: sandy soil, Juarez, 1905, *Purpus* (UC); San Diego, 1800 m. alt., *Hartman 612* (G, UC).

Cryptantha crassisepala is a very interesting and readily recognized species most related to *C. minima*. Although it usually produces four nutlets some forms of it regularly mature only two or three. It is one of these forms, indistinguishable in other respects, that was made the type of *C. dicarpa*. The consimilar nutlets of *C. crassisepala* and *C. minima* are rather thick for their breadth. In this respect, as well as in general contour, they strikingly simulate the nutlets of *C. albida*, a species not closely related. The only material suggestive of a condition intermediate between *C. minima* and *C. crassisepala* is Eastwood's collection from Grand Junction. In that collection nutlets typical of *C. minima* are associated with the naked inflorescence and habit of *C. crassisepala*.

Ser. VII. BARBIGERAE. Nutlets 1–4, verrucose or muricate, lanceolate to ovate-lanceolate, dorsally convex, laterally rounded or obtuse, homomorphous with the abaxial one always developing; style reaching only to ⅓ height of nutlets or in varying degrees longer, sometimes even somewhat surpassing them.

Nutlets normally solitary or rarely 2; style reaching 1/3–1/2 height of nutlets.....25. *C. decipiens.*
Nutlets normally 4; style reaching 2/3 height of nutlets or beyond.
  Spike solitary; style evidently surpassing nutlets.....26. *C. patula.*
  Spike geminate or ternate; style almost always shorter than nutlets.
    Hairs arming calyx-lobes very coarse, subobese; plant usually with an erect central axis; insular endemic....27. *C. foliosa.*
    Hairs arming calyx-lobes slender, not conspicuously thickened; plant irregularly branched.
      Corolla conspicuous; hirsute plants almost confined to coastal drainage of California.....28. *C. intermedia.*
      Corolla inconspicuous; plants of the Great Basin and Californian deserts.
        Plant spreading hirsute.....29. *C. barbigera.*

Plant with appressed hairs.
Nutlets verrucose or verrucose-muriculate.....30. *C. nevadensis*
Nutlets spinular-muricate.....31. *C. scoparia.*

25. **C. decipiens** (Jones) Heller. Loosely branched herb 1–4 dm. high, slender, strigose and frequently short-hispid; leaves rather few, linear, obtuse, 1–3 cm. long, 1–3(–4) mm. broad, strigose and sometimes hispid, minutely pustulate; spikes geminate or rarely ternate or solitary, slender, becoming loosely flowered or congested, 4–10 cm. long, naked; corolla inconspicuous to conspicuous, 0.8–3.5 mm. broad; fruiting calyces ovate to ovate-oblong, strictly ascending, asymmetrical, 2.5–7(–9) mm. long, deciduous, sessile; mature calyx-lobes lance-linear, decidedly connivent above with the tips frequently spreading or even recurving, midrib thickened and usually evidently hirsute, margins strigose, abaxial lobe evidently the longest and most hirsute; ovules 4; nutlets 1 or rarely 2, next the abaxial calyx-lobe, ovate-lanceolate or occasionally narrowly ovate, 1.5–2.4 mm. long, usually granulate or muriculate-granulate, muricate-papillate or low-tuberculate, usually brownish, back convex, sides rounded, groove open or closed but always dilated below to form a definite areola; gynobase short, ⅓–½ height of nutlet; style much surpassed by nutlet, ½–⅔ the height of nutlet.—Muhlenbergia viii. 48 (1912).

Var. **genuina.** Corolla inconspicuous, less than 1 mm. broad.—*Krynitzkia decipiens* Jones, Contr. W. Bot. xii. 6 (1910). *C. decipiens* Heller, l. c.

Southern Nevada, western Arizona and Southern California.

Nevada: Logan, *Kennedy 1838* (G, UC); Rhyolite, 1072 m. alt., *Heller 9632* (G). Arizona: Hot Springs, 1892, *Toumey* (UC). California: Kernville, *Brandegee* (UC); sandy places near Palm Springs, 120 m. alt., *Spencer 2072* (G); desert sand, mouth of Tahquitz Canyon, 210 m. alt., *Spencer 1522* (G); Whitewater, 300 m. alt., *Jones* (UC); without locality, *Palmer 150* (G).

Var. **corollata**, var. nov., a varietate genuina differt corolla conspicua 2–3.5 mm. lata.

Extreme western margin of the Mohave Desert and the adjacent coastal slopes.

California: Fort Tejon, *Xantus 85* (G); Sespe Creek near Ten Sycamore Flat, *Abrams & McGregor 173* (G); Matilija Canyon, Ojai Valley, 1896, *Hubby 20* (G); towards foothills, Ojai Valley, 1896, *Hubby 21* (G, type); Roble Canyon, San Rafael Mts., 1020 m. alt., *Hall 7408* (G, UC); Santa Inez Mts., 1888, *Brandegee* (UC); Huron, Fresno Co., *Brandegee* (UC); without locality, *Brandegee* (UC).

This species is probably most related to *C. intermedia* and *C. nevadensis* and has been somewhat confused with them. It differs, how-

ever, in having a very short style and gynobase and normally but one or rarely two nutlets.

26. **C. patula** Greene. Sparsely and loosely branched herb 5–15(–30) cm. high; stems strigose and sparsely short-hispid; leaves linear or lance-linear, 1–5 cm. long, 1–3 mm. broad, acutish, appressed-hispid, minutely pustulate; spikes solitary, with a few leafy bracts towards the base; corolla medium-sized, tube ca. 2 mm. long, limb 1.5–3 mm. broad, lobes short-oblong, ascending, ca. 1 mm. long, throat funnelform, appendages hemispherical; fruiting calyces ovate-oblong, 5–6 mm. long, obscurely biserial, subsessile, asymmetrical, base broadly conical or rounded; mature calyx-lobes lance-linear, connivent above with the herbaceous tips spreading, margins shortly white-villous, midrib thickened and densely tawny-hispid, abaxial lobe evidently the longest; nutlets 4, homomorphous, ca. 1.9 mm. long, oblong-ovate, acute, finely tessellate-granulate, tuberculate or muricate, base somewhat truncate, back convex, groove closed or nearly so and divaricately forked at base, at times open at the fork to form a small triangular areola; gynobase subulate, almost as long as the nutlets; style evidently surpassing nutlets.—Pittonia i. 265 (March 1889). *C. Pondii* Greene, l. c. 291 (April 1889).

Middle western Lower California and adjacent islands.

Lower California: San Bartolomé, 1889, *Pond* (G, isotype of *C. Pondii*); San Benito Island, 1897, *Brandegee* (G, UC).

Although probably most related to *C. intermedia* this species is readily separated by its solitary spikes and extreme southern range. *Cryptantha Pondii* is clearly a synonym. Although Greene described it as having "smooth and shiny" nutlets and ternate or quadrinate spikes the isotype sent Gray has granulate and tuberculate nutlets and solitary spikes as described above.

27. **C. foliosa** Greene. A stiffly erect divaricately branched herb 6–20 cm. high; stems solitary, straight, usually forming a conspicuous central axis, short-hispid below but becoming somewhat strigose above, branches well developed, widely spreading; leaves lanceolate to broadly linear, obtuse or rarely acutish, 2–6 cm. long, 2–5(–7) mm. broad, appressed-hispid, abundantly and minutely pustulate; spikes dense, 1–4 cm. long, geminate or ternate, naked; corolla evident, limb 2–3 mm. broad; fruiting calyces ovate-oblong, stiff, 5–7 mm. long, strongly biseriate, subsessile, subpersistent, base roughly conical; mature calyx-lobes lance-linear, towards the tips herbaceous and somewhat spreading, towards base indurated, thickened midrib armed with short

excessively coarse almost inflated pungent tawny hairs, margin strigose; nutlets 4, homomorphous, narrowly ovate, acute, ca. 1.5 mm. long, brownish and somewhat mottled, finely tessellate-granulate, tuberculate or muricate, back convex, edges obtusely angled, base rounded, groove narrowly dilated towards base where divaricately forked and closed; gynobase narrow, ca. 0.8 mm. long, ca. ⅔ height of nutlets; style reaching tip of nutlets.—Pittonia i. 113 (1887). *Krynitzkia foliosa* Greene, Bull. Calif. Acad. Sci. i. 205 (1885).

Endemic to Guadalupe Island, off the west coast of Lower California.

Lower California: Guadalupe Island, *Palmer 68*, *842* and *877* (G), *Anthony 238* (G, UC), *Greene* in 1885 (G, UC, isotypes), *Townsend* (UC), *Brandegee* in 1897 (UC).

Readily recognized because of its peculiar habit of branching, congested spikes, coarsely armed calyx-lobes and small nutlets.

28. **C. intermedia** (Gray) Greene. Erectly branched commonly stiff and very hirsute herb 1.5–5 dm. high; stems several or solitary, erect, commonly hirsute but frequently more or less strigose; leaves lanceolate to linear or rarely somewhat oblanceolate, acute to obtuse, 2–6(–7.5) cm. long, 1–5(–7) mm. broad, hirsute or strigose, usually inconspicuously pustulate; spikes naked, geminate to quinate but commonly ternate, 5–15 cm. long, usually stiff; corolla conspicuous, 2–8 but commonly about 5 mm. broad; fruiting calyces ovate-oblong, 2–7 but commonly 4–6 mm. long, ascending or strict, deciduous, slightly asymmetrical, lowermost not conspicuously biserial, pedicels ca. 0.5 mm. long; mature calyx-lobes lance-linear, connivent above with tips usually spreading or recurving, margin appressed-hispid or short-villous, midrib thickened and pungently hirsute, abaxial lobe longest and most hirsute; nutlets commonly 4, homomorphous, lance-ovate, ca. 2 (1.5–2.3) mm. long, more or less coarsely and decidedly tuberculate or verrucose, frequently somewhat granulate, grayish or brownish, margins slightly angled, back convex, groove narrow or closed but gradually dilated towards base into a small triangular areola; gynobase ⅔–¾ height of nutlets, narrow; style usually about reaching the nutlet-tips or rarely slightly surpassing or surpassed by them.—Pittonia i. 114 (1887). *Eritrichium intermedium* Gray, Proc. Am. Acad. xvii, 225 (1882). *Krynitzkia intermedia* Gray, Proc. Am. Acad. xx. 273 (1885); Synop. Fl. N. Am. ii. pt. 1, Suppl. 426 (1886). *C. quentinensis* Macbr. Contr. Gray Herb. n. s. lvi. 58 (1918). *C. barbigera*, var. *Fergusonae* Macbr. l. c. 59. *C. intermedia*, var. *Johnstonii* Macbr. l. c. 59.

Coastal drainage from northern California to northern Lower California, and infrequent along the desert borders.

BRITISH COLUMBIA: probably introduced in ballast, vicinity of Victoria, *Macoun 672* (G). CALIFORNIA: Scott River Valley, 1899, *Gilbert* (UC); Castilla, *Eastwood 1366* (G); McCloud River near fish hatchery, *Heller 13021* (G); near Redding, *Heller 7883* in pt. (G); Hyampom, 1883, *Rattan* (G); Berry Canyon near Clear Creek, *Heller & Brown 5510* (G); 16 km. east of Alder Springs, *Heller 11461* (G); Colusa Co., 1884, *Curran* (G); Stony Creek, Colusa Co., *Rattan 43* (G); north side of Marysville Butte, *Heller 11368* (G); St. Helena, 1896, *Jepson* (G); Oakley, 1900, *The Postmaster* (UC); table hills near Sheepranch, *Davy 1622* (UC); San Antonio Creek, *Davy 1567* (UC); Rancho Encinal, Monterey Co., 1903, *Kellogg* (G); Carmel River above Mission, *Heller 6587* (G); Soledad, 1881, *Congdon* (UC); Aliso Canyon, 1897, *Barber* (UC); Cuyama, 1896, *Eastwood* (UC); Ellwood, *Eastwood 10* (G, UC); Painted Cave Ranch, *Eastwood 67* (G, UC), Santa Barbara, *Rothrock 88* (G); Santa Barbara, *Elmer 3866* (G); Ojai Valley, 1896, *Hubby 22* (G); Saugus, 1889, *Brandegee* (UC); Saugus, 1901, *Davy* (UC); San Fernando Wash, 1913, *Eastwood* (G); San Fernando Mts., 1882, *Nevin* (G, UC); San Fernando, *Nevin* (UC); Los Angeles, *Nevin* (UC); Los Angeles, *Gambel* (G); Los Angeles, 1880 to 1882, *Nevin* (G, including TYPE of *C. intermedia*); sandy creek margin, Verdugo Canyon, *Macbride & Payson 748* (G); Elysian Park, 1901, *Setchell* (UC); Santa Monica Experiment Station, *Barber 48* (UC); Topango Canyon, 1916, *Crawford & Hiatt 257* (G); Playa del Rey, *Abrams 2512* (G, UC); San Pedro, 1889, *Brandegee* (UC); dry hillsides back of Laguna Beach, 150 m. alt., *Johnston 1934* (G); Santa Catalina Island, 1890, *Brandegee* (UC); Santa Catalina Island, *Grant 242* (UC); Santa Clemente Island, 1880, *Nevin & Lyon* (G, a peculiar form); hills near Pomona, *Baker 4744* (G); Claremont, *Chandler* (UC); Claremont, *Baker 4137, 4769* and *4773* (G); Claremont, *Johnston 1938* (G, TYPE of *C. intermedia*, var. *Johnstonii*); San Antonio Canyon, *Johnston 2046, 2047, 2048* and *2049* (G); near Upland, *Parish 11154* (G, UC), *Johnston 1957, 1959* and *1960* (G); east of Victorville, *Spencer 838* (G); rocky hillside, Victorville, 900 m. alt., *Munz & Harwood 3472* (UC); near Barstow, *Spencer 290, 294* and *2083* (G); Mohave Desert, *Lemmon 207* (G); vicinity of San Bernardino, *Parish 929* (UC), *1215* (G), *3660* (G, UC), *6940* (UC), *11117* (UC), *11299* (UC); San Bernardino, *Wright 98* (G); Colton, 1882, *Cleveland* (UC); Highland, *Spencer 1112* (G); vicinity of Riverside, *Hall 2991* (UC); San Jacinto Valley, 1897, *Reinhardt* (UC); Winchester, *Hall 399* (UC); Thomas Valley, *Hall 2180* (UC); Hemet Valley, 1890, *Orcutt* (UC); Hemet Valley, *Munz 5784* (G); Van Deventers, *Hall 1161* (UC); Saunders Meadow, San Jacinto Mts., *Spencer 2275* (G); Maillard Canyon near Banning, *Spencer 2087* and *2063* (G); Snow Creek near Palm Springs, *Spencer 2065b* (G); Cabazon Station, *Abrams 3214* (G); Palm Springs, *Spencer 850, 851, 852* and *863* (G); Palm Springs, *Ferguson 42* (G, TYPE of *C. barbigera*, var. *Fergusonae*); Tahquitz Canyon, *Spencer 1518* (G); Mission Canyon, *Spencer 1783* (G); dry hills 5 km. east of Murietta, 450 m. alt., *Munz & Johnston 5317* (UC); Moro Hills near Fallbrook, *Abrams 3317* (G); Foster, *Hall 3883* (UC); Mesa Grande, *Spencer 1179* (G); Ramona, 1894, *Brandegee* (UC); Witch Creek, 1894, *Alderson* in pt. (G); Descanso Grade, 1906, *K. Brandegee* (UC); Del Mar, 1894, *Brandegee* (UC); La Jolla, *Clements 106* (G, UC); and *107* (G); Point Loma, *Eastwood 2937* (G); Point Loma, 1903, *K. Brandegee* (UC); San Diego, *K. Brandegee* (UC); San Diego, *Greene* (UC); San Diego, *Spencer 36, 37, 1348, 1349* and *1350* (G); San Diego, *Palmer 257* (G); San Diego, *Brandegee 3416* (G, UC) Laguna Mts., *Spencer 922, 923, 929* and *938* (G); Laguna, 1885, *Cleveland 920, 921* and *2275* (G); near Campo, 1885, *Orcutt 1278* (UC); near Campo, *Abrams 3556* (G). LOWER CALIFORNIA: Todos

Santos Island, *Anthony 213* (G, UC) and *204* (G); Ensenada, 1889, *K. Brandegee* (UC); Burro Canyon, 1895, *Brandegee* (UC); Cariso Creek, 1893, *Brandegee* (UC); San Quentin Bay, *Palmer 608* (UC) and *695* (G, TYPE of *C. quentinensis;* UC, ISOTYPE); without locality 1883, *Orcutt* (G).

A variable and perplexing species the sharp delimitation of which seems quite impossible. At the northern extreme of its range it passes into *C. Hendersoni*. But outside the zone of intergradation in the northernmost counties of California, *C. intermedia* is readily distinguished from the more northerly ranging *C. Hendersoni* by having narrower, lance-ovate, strongly verrucose nutlets and decidedly pungent hairs on stem and calyx. In the southern part of its range *C. intermedia* passes even more completely into *C. barbigera* and *C. nevadensis*. The two latter species inhabit the desert and probably represent modifications of the *C. intermedia*-stock as adaptations to that extreme environment. Material transitional between *C. intermedia, C. barbigera* and *C. neradensis* comes from the western margin of the Californian deserts or from the hot interior coastal valleys more or less connected with the desert proper. *Cryptantha barbigera* and *C. nevadensis* differ from *C. intermedia* primarily in their minute corollas. *Cryptantha barbigera* appears to be a derivative of *C. intermedia* with bristly stems and evidently villous as well as hirsute calyces. On the other hand, *C. nevadensis* has tended to develop a wiry habit, strigose pubescence and very elongate nutlets. Intergradation among them being beyond question, *C. Hendersoni, C. intermedia* and *C. nevadensis,* with much justification, might be treated as mere varieties of *C. barbigera*. It seems best to adhere to the traditional classification, however, and retain the four groups as specific, since such an extended concept as their union would be unwieldy. As various other species in this genus are more or less connected by local intergradation an unfortunate precedent might be set if, in the present instance, drastic reductions were made because of the occurrence of local transition.

The species varies considerably in pubescence. Though the plant is sometimes closely short-strigose, the common form is densely pungent-hirsute throughout. In some forms the calyx is appressed-hispid, in others hispid-villous or even somewhat silky, though the midrib of the calyx-lobe is practically always more or less pungent-hirsute. *Cryptantha quentinensis* is a form which is not hirsute and has a rather silky calyx. It is clearly a phase of *C. intermedia* and is not a relative of *C. oxygona* as its author suggests. *Cryptantha barbigera*, var. *Fergusonae* is a form of *C. intermedia* with rather long-villous calyx-lobes. The type is one of the suite of puzzling plants from the desert

border which connect *C. barbigera* and *C. intermedia*. *Cryptantha intermedia*, var. *Johnstonii* differs from *C. barbigera*, var. *Fergusonae* only by not being conspicuously villous on the calyx. It appears to be one of the very large-flowered, coarse phases of *C. intermedia*. Material of *C. intermedia* from the eastern margin of the Colorado Desert not infrequently has the style definitely surpassing the nutlet-tips whereas that from other regions seems uniformly to have the style not reaching beyond the nutlets.

29. **C. barbigera** (Gray) Greene. Erectly branched hirsute herb 1–4 dm. high; stems solitary or several, very bristly and sparsely if at all strigose; leaves oblong to lance-linear, obtuse, 1–5(–7) cm. long, 3–7(–13) mm. broad, hirsute, inconspicuously pustulate; spikes geminate or rarely solitary or ternate. naked, becoming as much as 15 cm. long; corolla inconspicuous, limb 1–2 mm. broad; fruiting calyx 5–10 mm. long, ovate-oblong or oblong-lanceolate, ascending, asymmetrical, deciduous; pedicels 0.3–0.7 mm. long, villous; mature calyx-lobes lanceolate to linear-lanceolate, connivent above with tips recurved, margin conspicuously long white-villous, midrib thickened and hirsute, abaxial lobe slightly the longest; nutlets 1–4, homomorphous, lance-ovate, 1.5–2.5 mm. long, strongly verrucose, usually brownish, back convex, edges obscurely angled or rounded, groove opened or closed but towards base gradually dilated to form a triangular areola; gynobase narrow, ⅔–¾ height of nutlets; style reaching to or slightly beyond the nutlet-tips.—Pittonia i. 114 (1887). *Eritrichium barbigerum* Gray, Synop. Fl. N. Am. ii. pt. 1, 194 (1878). *Krynitzkia barbigera* Gray, Proc. Am. Acad. xx. 273 (1885). *K. mixta* Jones, Contr. W. Bot. xiii. 6 (1910).

Southern California and southern Utah, to Arizona and northern Lower California.

UTAH: deep sand, Diamond Valley, *Goodding 889* (G, UC); St. George, 900 m. alt., *Jones 5106* (UC, ISOTYPE of *K. mixta*); Utah, *Parry 171* (G, TYPE of *E. barbigerum*); without locality, *Palmer 348* (G). CALIFORNIA: floor of canyon, Silver Canyon in White Mts. east of Laws, *Heller 8270* (G, UC); Providence Mts., *Munz, Johnston & Harwood 4281* (UC); Baxter, *Parish 9869* (UC); sandy places near Barstow, 900 m. alt., *Spencer 2089* and *2092* (G); Victor, 780 m. alt., 1903, *Jones* (UC); Mohave Desert, 1880, *Lemmon* (G); sandy canyon floor, Palm Canyon, 300 m. alt., *Johnston 1053* (G); Palm Canyon, 210 m. alt., *Spencer 1513* (G); crevices of rocks near Indian Wells, 105 m. alt., *Spencer 1519* (G); Canyon Springs, *Hall 5856* (UC); desert sand, Indio, 90 m. alt., *Spencer 1516* (G); sandy wash and among rocks in lower hillsides, Shavers Well near Mecca, 75 m. alt., *Munz & Keck 4757* (G, UC); San Felipe Creek, *Eastwood 2710* (G); San Felipe Creek, 1894, *Brandegee* (UC); desert sand, Mountain Springs, 780 m. alt., *Spencer 187, 200a* and *862* (G); sandy p'aces, Colorado Desert, *Spencer 189* and *191* (G); Colorado Desert, 1889, *Brandegee* (G); Colorado Desert, *Orcutt 2264* (UC). ARIZONA: Diamond

Creek, 1893, *Wilson* (UC); near Tempe, 1897, *Bolton* (UC); Verde Mesa, *Smart 126* (G); Nogales, 1892, *Brandegee* (UC); Benson, 1882, *Dunn* (UC); Patagonia Mts., 1902, *Orcutt* (UC); Clifton, *Rusby 285* (UC); Clifton, *Davidson 174a* (UC); mesas near Camp Lowell, 1881, *Pringle* (G); Tucson, 1894, *Toumey* (UC); Sabino Canyon, 1894, *Toumey* (UC); Tucson Mts., *Thornber 532* (UC); Tucson, 1907, *Loyd* (G); Yucca, 1912, *Wooton* (G); without locality, 1876, *Palmer* (G). LOWER CALIFORNIA: San Telmo, 1893, *Brandegee* (UC); San Esteban, 1889, *Brandegee* (UC); Lagoon Head, *Palmer 780* (G, UC); San Luis, 1889, *Brandegee* (UC); San Sebastian, 1889, *Brandegee*.

When Gray originally described *Eritrichium barbigerum* he had before him materal now referred to *C. barbigera*, *C. nevadensis* and *C. intermedia*. The plant here treated as *C. barbigera* constituted the bulk of the material first described as *E. barbigerum* and almost wholly that which he later designated as *Krynitzkia barbigera*. Parry's number 171, which is taken as type, is a large and very fine example of the species, having coarse leaves, and very elongate, apically recurved, long-villous calyx-lobes. In some of its forms the species is scarcely more than a minute-flowered phase of *C. intermedia*. When typically developed it is very characteristic because of its large leaves and conspicuously villous, elongate calyx-lobes.

30. **C. nevadensis** Nels. & Kenn. Slender, strigose herb 1–5 dm. high; stems erect or becoming flexuous, solitary or several, closely short-strigose and at times sparsely hirsute, closely or laxly branched; leaves linear-oblanceolate to linear, acute or obtuse, 1–4 cm. long, 1–5(–7) mm. broad, not numerous, appressed-hispid, more or less pustulate; spikes geminate or ternate, occasionally bracted toward the base, congested and somewhat glomerate or elongate and becoming 15 cm. long; corolla inconspicuous, limb 1–2 mm. broad; fruiting calyx oblong-ovate to lanceolate, 5–12 mm. long, ascending, slightly asymmetrical, pedicels ca. 0.5 mm. long; mature calyx-lobes lanceolate or linear, connivent above with the slender tips usually recurving, margins more or less villous, midrib thickened and hirsute; nutlets 4, homomorphous, verrucose or towards the tip muriculate, lance-ovate to lanceolate, 2–2.9 mm. long, back convex, margins somewhat angled, groove open or closed but below dilated into a small areola; gynobase narrow, ⅔–¾ length of nutlets; style reaching to or almost to the tips of the nutlets.—Proc. Biol. Soc. Wash. xix. 157 (Nov. 1906).

Var. **genuina**. Stems very slender, usually flexuous, strigose; calyx 8–12 mm. long; nutlets lanceolate, long acuminate, back verrucose but conspicuously muricate towards the apex, ca. 2.5 mm. long. —*C. nevadensis* Nels. & Kenn. l. c. *Krynitzkia barbigera*, var. *inops* Brandg. Zoe v. 228 (Sept. 1906). *C. barbigera*, var. *inops* Macbr. Proc. Am. Acad. li. 548 (1916). *C. arenicola* Heller, Muhl. ii. 242

(Dec. 1906). *C. leptophylla* Rydb. Bull. Torr. Bot. Cl. xxxvi. 678 (1909).

Deserts from Utah and Nevada to Arizona and northern Lower California.

UTAH: St. George, *Palmer 350* (NY, TYPE of *C. leptophylla*). NEVADA: Trinity Mts., 1500 m. alt., *Watson 850* (G); stony north slope, Moapa, *Goodding 2201* (G, UC); Rhyolite, 1072 m. alt., *Heller 9657* (G); foot of cliffs, Meadow Valley, *Goodding 2165* (G); open sand, Candelaria, 1800 m. alt., *Shockley 288* (UC). ARIZONA: Grand Canyon, 1888, *Gray* (G); Diamond Creek, 1893, *Wilson* (UC); Yucca, 1912, *Wooton* (G); without locality, 1876, *Palmer* (G). CALIFORNIA: Swansea, *Hall & Chandler 7178* (UC); Panamint Canyon, *Hall & Chandler 7038* (G, UC); sand hills west of Laws, *Heller 8203* (G, UC); Surprise Canyon, 640 m. alt., *Coville & Funston 700* (G); The Needles, 1884, *Jones* (UC); Kramer, 1905, *K. Brandegee* (UC); Tehachapi, 1905, *K. Brandegee* (UC); around and under small bushes, Barstow, *K. Brandegee 157* (G, UC); 16 km. east of Daggett, 600 m. alt., *Munz & Harwood 3672* (UC); Hesperia, 1050 m. alt., *Parish 4850* (UC); sandy places, Mohave Desert, 300 m. alt., *Spencer 438* (G); dry sandy plain, 5 km. east of Warren's Well, 960 m. alt., *Munz & Johnston 5176* (G); deep sand at mouth of Tahquitz Canyon, 210 m. alt., *Spencer 1525* (G); deep sand, Palm Springs, 135 m. alt., *Spencer 848* (G); San Felipe, 1898, *Purpus* (UC); desert sand, Mountain Springs, 678 m. alt., *Spencer 188* and *859* (G); sand, Colorado Desert, *Spencer 184* (G); gravelly hills, Colorado River, 1854, *Bigelow* (G). LOWER CALIFORNIA: mountains of northern Lower California, *Orcutt 1279* (UC).

Var. **rigida**, var. nov., erecta non rariter plus minusve hirsuta; calycibus 5–10 mm. longis; nuculis oblongo-ovatis acutis verrucosis ca. 2 mm. longis.

Western portion of Mohave Desert and neighboring coastal slopes; also in western Arizona.

CALIFORNIA: Bakersfield, *Davy 1875* (UC); Poso Creek, *Hall & Babcock 5014* in pt. (UC); sandy soil, Pampa Station, *Heller 7645* (G, UC); high ridge west of McKittrick, *Heller 7788* (G, UC); Fort Tejon, *Xantus 85* (UC); Mohave, *Davy 2161* (UC); Palmdale to Little Rock, *Davy 2291* (UC); Llano Verde, *Davy 2306* (UC); desert sand, Hesperia 930 m. alt., *Spencer 389, 403* and *419* (G); sand, Mohave Desert, *Spencer 411* and *555* (G); hills bordering Mohave Desert, 1882, *Pringle* (G, TYPE). ARIZONA: Wickenburg, *Jones 343* (G); Verde Mesa, *Smart* (G).

This species was first described as *Krynitzkia barbigera*, var. *inops*. If the varietal name is to be accepted it is only after *C. intermedia* has been reduced to a variety of *C. barbigera*. *Cryptantha nevadensis*, var. *genuina* is a striking plant on account of its wiry, strigose, usually flexuous stems, very elongate calyces and lanceolate attenuate nutlets. Its habit is suggestive of *C. dumetorum*, since it grows in shelter of shrubs and frequently scrambles up through them. The stems are also very brittle. The variety *rigida*, with which the var. *genuina* is confluent, has the habit and nutlets of some forms of *C. intermedia*.

From that species it differs in its small corollas and in invariably having strigose pubescence. The variety intergrades with *C. intermedia* and through it *C. nevadensis*, var. *genuina* is related to *C. intermedia* and eventually to *C. barbigera*. The axial nutlet of *C. nevadensis*, var. *genuina* is frequently somewhat smoother than the others and usually has a closed groove.

31. **C. scoparia** Nels. Erectly branched stiff usually strigose herb 1–3.5 dm. high; stems closely short-strigose and frequently also sparsely hispid; leaves linear to lance-linear, obtuse, 2–4 cm. long, 1–3 mm. broad, strictly ascending, strigose or appressed-hirsute, finely pustulate; spikes stiff, naked, solitary or geminate, 2–10 cm. long; corolla inconspicuous, tube about equalling calyx, limb ca. 1 mm. broad; fruiting calyx ovate-oblong, 5–6 mm. long, strictly ascending, subsessile, slightly asymmetrical, becoming rather obscurely biserial at maturity and 5–10 mm. distant; mature calyx-lobes lance-linear, stiffish, usually subconnivent above with the herbaceous tips somewhat spreading, midrib thickened and hirsute, margins shortly canescent-villous, axial lobe slightly the longest; nutlets 4, homomorphous, lanceolate to broadly lanceolate, 1.8–2.2 mm. long, antrorsely spinulose-muriculate especially towards apex, margins and base rounded, groove narrow and forked below where occasionally open to form a small triangular areola; gynobase subulate, about ¾ height of nutlets; style reaching to tip of nutlets.—Bot. Gaz. liv. 144 (1912); Macbr. Contr. Gray Herb. n. s. xlviii. 48 (1916). *C. muriculata*, var. *montana* Nels. Erythea vii. 69 (1899).

Southwestern Wyoming, southern Idaho and eastern Washington.

WYOMING: Granger, 1898, *Nelson* (G, ISOTYPE of *C. muriculata*, var. *montana*). IDAHO: loose, disturbed soil near road, Challis, 1620 m. alt., *Macbride & Payson 3221* (G); Big Butte Station, *Palmer 204* (G); Aberdeen, *Piper 5030* (G); sagebrush land, Minidoka, *Nelson & Macbride 1801* (G), *1311* (G, ISOTYPE of *C. scoparia*); dry slopes, Castleford, *Nelson & Macbride 2231* (G); Buhl, *Nelson & Macbride 1703* (G). UTAH: Ogden Hot Springs, 1903, *Stokes* (UC). WASHINGTON: plains, Morgan's Ferry, *Suksdorf 405* (G) and *1494* (UC).

In gross habit much suggesting *C. nevadensis*, but differing in its shorter fruiting calyces and particularly in its spinulose nutlets. In addition to these morphological differences the ranges of *C. nevadensis* and *C. scoparia* are separated by the northern half of Nevada.

Ser. VIII. MURICATAE. Nutlets 4, verrucose or coarsely tuberculate, triangular-ovate, decidedly homomorphous, back obtuse and bearing a suggestion of a medial ridge, with sides evidently

angled and beaded; style usually surpassing the nutlets though rarely only equalling them.

32. **C. muricata** (H. & A.) Nels. & Macbr. A tawny-green erect hirsute herb 1–10 dm. tall; stems solitary or several, conspicuously hirsute and rarely also short appressed-hirsute, usually stiff, branches few and ascending or paniculate; leaves linear to oblance-linear, 1–5(–9) cm. long, 2–4 mm. broad, villous-hirsute, usually inconspicuously pustulate; spikes few to very numerous, naked, geminate to quinate, 2–15 cm. long; corolla minute to conspicuous, 1–7 mm. broad; appendages well developed; fruiting calyx, ovate, 2–4 mm. long, deciduous, subsessile, older ones obscurely biserial; mature calyx-lobes lanceolate, decidedly connivent, once to twice length of nutlets, margins short-hispid, midrib thickened and tawny-hirsute; nutlets 4, homomorphous, ovate-triangular, 1.5–2.5(–3) mm. long, lucid or dull, verrucose or tuberculate, frequently somewhat granulate, margin angled and usually beaded, base truncate, back frequently obtuse-angled, groove narrow or closed and towards base broadly forking or dilated into a small areola; gynobase elongate, about $^4/_5$ length of nutlets; style much surpassing the nutlets or rarely scarcely reaching them.—Bot. Gaz. lxi. 42 (1916).

Var. **genuina.** Corolla conspicuous, 2–7 mm. broad; stems with (usually a few) well developed terminally floriferous lateral branches; spikes for the most part not especially numerous.—*Myosotis muricata* H. & A. Bot. Beechey 369 (1840). *C. muricata* Nels. & Macbr. l. c. *Eritrichium muriculatum* A. DC. Prodr. x. 132 (1846). *Krynitzkia muriculata* Gray, Proc. Am. Acad. xx. 273 (1885) *C. muriculata* Greene, Pittonia i. 113 (1887). *C. horridula* Greene, Pittonia v. 55 (1902).

Western California in and along the Coast Ranges from Monterey to Los Angeles counties.

California: Point Sur, 1888, *Brandegee* (UC); Sur River, 1893, *Eastwood* (UC); Salinas River, 1885, *Curran* (UC, isotype of *C. horridula?*); Santa Lucia, 1897, *Plaskett* (UC); Pine Mts. back of San Simeon Bay, *Palmer 376* (G, UC); San Simeon, 1888, *Brandegee* (UC); Salinas River near Poza, 1902, *Eastwood* (G, UC); Painted Cave Ranch, *Eastwood 66a* (G); Santa Barbara, 1889, *K. Brandegee* (UC); dry hills near sea, Ventura, *Brewer 232* (G, UC); Topatopa Mts., 1650 m. alt., *Abrams & McGregor 94* (G); Santa Clara River, 1885, *Gray* (G); creek arroyo, Ojai Valley, *Hubby 24* (G); Sulphur Mt., *Hubby 23* (G); Oakgrove Canyon, Liebre Mts., 900–1200 m. alt., *Abrams & McGregor 343* (G); Leonis Valley, Antelope Valley, *Davy 1648* (UC); creek bed, Saugus, *K. Brandegee* (G, UC); Topango Canyon, Santa Monica Mts., *Crawford & Hiatt 326* (G); Sepulveda Canyon, Santa Monica Mts., *Abrams 2555* (G, UC); South Beach, 1898, *Barber* (UC); Los Angeles, 1880, *Nevin* (G); Pasadena, *Grant 238* in pt. (G); without locality, *Douglas* (G, isotype of *M. muricata*).

Var. **Jonesii** (Gray) Johnston. Corolla inconspicuous, 1–2.5 mm. broad; stems commonly solitary and erect or several and fastigiate, clothed to below middle with numerous very short floriferous branchlets; spikes usually short, very numerous, grouped to form an elongate leafy paniculate inflorescence.—Plant World xxii. 114 (1919). *Krynitzkia Jonesii* Gray, Proc. Am. Acad. xx. 274 (1885). *C. Jonesii* Greene, Pittonia i. 113 (1887). *C. vitrea* Eastw. Proc. Calif. Acad. Sci. ser. 3, ii. 292 (1902); Fl. S. Fk. Kings River 77 (1902).

Middle and Southern California and the northern part of Lower California.

California: gravelly slopes, Alder Springs, Glenn Co., *Heller 11449* and *11450* (G); Lake County, 1898, *Purpus* (UC); Mt. St. Helena, *K. Brandegee* (G, UC); Tamalpais, 1892, *Bioletti* (G); along railroad above West Point, Tamalpais, 1907, *K. Brandegee* (UC); Mt. Tamalpais, 1899, *Congdon 40* (G); Tamalpais, 1892, *K. Brandegee* (UC); above Whitlocks, Mariposa Co., 1897, *Congdon 52* (G); Yosemite, 1897, *Congdon 41* (G); Leavitts Meadow, 1898, *Congdon* (G); Bubbs Creek, S. Fk. of Kings River, 1899, *Eastwood* (G, part of type of *C. vitrea*); Tenaya Trail, Yosemite Nat. Park, 1650 m. alt., *Hall 8940* (UC); Ben Lomond, Santa Cruz Co., 1890, *Brandegee* (UC); Soledad, 1882, *Jones* (G); Santa Cruz, *Jones 2810* (G, type of *K. Jonesii*); above Alma Soda Springs near "French Settlement," Santa Clara Co., *Heller 7491* (G, UC); Santa Cruz Island, 1888, *Brandegee* (UC); Santa Cruz Island, 1886, *Greene* (UC); dry sandy ground near Upland, 360 m. alt., *Johnston 1958* (G); side of road, San Antonio Canyon, 720 m. alt., *Johnston 2048a* (G); Summit of Cajon Pass, *Spencer 345* (G); sandy wash, Highland, 300 m. alt., *Spencer 1306* (G), dry sandy ground, San Bernardino, 360 m. alt., *Johnston 1886* (G); foothills, San Bernardino, *Parish 929* (G); dry mesas, San Bernardino Valley, 300 m. alt., *Parish 11118* (G, UC); stony sandy slopes, Banning, 692 m. alt., *Spencer 1781* (G); San Jacinto Valley, 1897, *Reinhardt* (UC); Chalk Hill, San Jacinto Mts., 1500 m. alt., *Hall 2052* in pt. (UC); Palamar Mts., 1200 m. alt., *Chandler 5355* (UC); Ramona, 1894, *Brandegee* (UC); Mesa Grande, 1220 m. alt., *Spencer 1178, 1302* and *1303* (G); Witch Creek, 1894, *Anderson* (G); Lakeside, 1894, *Brandegee* (UC); mesa, La Jolla. *Clements 108* (G, UC); in chaparral, vicinity of San Diego, 520 m. alt., *Spencer 38* (G, UC); Mission Hills, San Diego, *Abrams 3418* (G); Point Loma, 1906, *K. Brandegee* (UC); Point Loma, 1902, *Brandegee 1646* (G, UC). Lower California: Todos Santos Bay, 1885, *Greene* (UC); near U. S. border, 1884, *Orcutt 1022* (G); near Jamul, 1885, *Orcutt 1281* (G); Topa, 1884, *Orcutt 1127* (G); Vallederos, 1893, *Brandegee* (UC).

Var. **denticulata** (Greene), comb. nov. Corolla inconspicuous, 1–2 mm. broad; plant with a few well developed loose branches; spikes not numerous; nutlets usually larger than in var. *Jonesii*.—*Krynitzkia denticulata* Greene, Bull. Calif. Acad. Sci. i. 205 (1885). *C. denticulata* Greene, Pittonia i. 114 (1887). *C. densiflora* Nels. & Kenn. Proc. Biol. Soc. Wash. xix. 156 (1906).

Western Nevada and adjacent California, southward to western Arizona and the mountains of Southern California

Nevada: Dog Valley Road, 1895, *Hillman* (UC); Clear Creek Canyon, 2000–2615 m. alt., *Baker 1381* (G, UC); Reno, 1884, *Curran* (G); near Reno, 1893, *Hillman* (UC); along railroad above Laughton's, 1894, *Hillman* (UC), Verdi, 1904, *Kennedy 952* (UC, isotype of *C. densiflora*); Hunter Creek, Washoe Co., 1800 m. alt., *Kennedy 1917* (G); western Nevada, 1884, *Curran* (G, UC, isotypes of *K. denticulata*). Arizona: mesas near Camp Lowell, 1881, *Pringle;* Skull Valley, 1290 m. alt., 1903, *Jones 7028* (UC); Yucca; 1884, *Jones 26* (G). California: Truckee, 1887, *Sonne* (UC); Donner Lake, 1888, *Curran* (UC); Summit Station, Placer Co., 2083 m. alt., *Heller 12886* (G); Mammoth, 1913, *K. Brandegee* (UC); open pine woods, Mt. Wilson, *Abrams 2590* (G); dry rocky canyon floor, Coldwater Fk. of Lytle Creek, 2100 m. alt., *Johnston 2073* (G, UC); rocky ground under pines near head of N. Fk. Lytle Creek, 2250 m. alt., *Johnston 2077* (G, UC); sunny rocky summit, Telegraph Peak, 2700 m. alt., *Johnston 1542* (G); open place on canyon floor, N. Fk. San Antonio Canyon, 2400 m. alt., *Johnston 1598* (G, UC); dry sunny canyon side, San Antonio Canyon, 1110 m. alt., *Johnston 1950* (G); Little Green Valley, *Hall 12* (UC).

A species readily recognized by its ovate-triangular nutlets, tawny pubescence, and characteristic yellowish-green herbage. It breaks up into three intergrading varieties. The var. *genuina*, characterized by its large corollas, occurs in western California. It varies noticeably in the size of the nutlets and fruiting calyces. The type of *C. muricata* is one of the coarse, large-flowered forms and was probably collected by Douglas somewhere between Monterey and Santa Barbara. The other varieties are small-flowered. The var. *Jonesii* commonly assumes a peculiar erect habit by which it can be distinguished at a glance from all other forms in the genus. The stems are usually single or several and fastigiate, and are erect, producing in the upper half or two-thirds abundant very short floriferous branchlets. Rarely the plant becomes diffusely branched. The distribution of var. *Jonesii* is peculiar. It occurs in the Coast Ranges from Santa Cruz to Glenn County, and in the middle Sierra Nevada. Jumping the several hundred kilometers occupied by the var. *genuina* it reappears in the vicinity of San Bernardino and is frequent from there south into Lower California. The var. *denticulata* is perhaps unworthy of recognition since it is frequently distinguishable from the var. *Jonesii* only with difficulty. It differs chiefly in habit, being sparsely and loosely long-branched. It grows in western Nevada in the general region of Reno, in California about Truckee, in western Arizona and in the pine belt of Southern California. The material from Nevada usually has coarsely granulate nutlets and perhaps might be separable from the southern material that I have associated with it.

Ser. IX. AMBIGUAE. Nutlets 1–4, smooth to papillate or tuberculate, ovate, dorsally low-convex, laterally rounded or obtuse

or occasionally acutish, homomorphous, no particular nutlet always developing; style reaching to $^2/_3$–$^3/_3$ height of nutlets.

Corolla conspicuous.
- Plant low, stiff, spreading, widely branched; spikes solitary..33. *C. mariposae.*
- Plant erectly branched, less rigid; spikes ternate or geminate.
  - Pedicels slender, evident, 2-3 mm. long; pedicels and calyx conspicuously long white-villous.....34. *C. crinita.*
  - Pedicels stout, inconspicuous, less than 1 mm. long; pedicels and calyx more or less hispid.
    - Nutlets usually single, commonly horizontal, equalling or longer than the short loosely connivent calyx-lobes.....35. *C. excavata.*
    - Nutlets usually 4, erect, evidently shorter than the decidedly connivent calyx-lobes.....36. *C. Hendersoni.*

Corolla inconspicuous.
- Nutlets minute, less than 1.5 mm. long; spikes bracted throughout.....37. *C. Traskae.*
- Nutlets usually 2–2.5 mm. long; spikes naked or bracted only at base.
  - Nutlets smooth, rarely finely granulate; spikes usually geminate; plant commonly 2–4 dm. tall.....38. *C. Torreyana*
  - Nutlets somewhat tuberculate, densely granulate or granulate-muricate as well as more coarsely roughened.
    - Plant closely strigose, pale, usually 2–3 dm. tall; spikes commonly geminate or ternate.....39. *C. simulans.*
    - Plant spreading-hispid, usually 1–1.5 dm. tall; spikes usually solitary or rarely geminate.
      - Nutlets with low rounded tubercules.....40. *C. ambigua.*
      - Nutlets with elongate papillae or spicules.....41. *C. echinella.*

33. **C. mariposae**, sp. nov., humilis saepe basaliter ramosa 5–15 cm. alta; ramis paucis laxe ascendentibus breviter strigosis; foliis paucis firmis oblanceolatis vel oblongo-oblanceolatis 0.8–1.8 mm. longis 2–5 mm. latis obtusis integerrimis adpresse breviter hispidis inconspicue pustulatis, superioribus paullo reductis, inferioribus oppositis subpersistentibus; spicis solitariis vel geminatis 3–10 cm. longis rigidis ebracteatis vel basem versus pauce folioso-bracteatis; floribus obscure biseriatis, inferioribus 5–10 cm. distantibus; calycibus fructiferis oblongo-ovatis 5–7 mm. longis ascendentibus subsessilibus; lobis calycis lineari-lanceolatis in costa infra medium cum setis flavescentibus horridis et in marginibus adpresse hispidis, supra medium breviter hirsutis et saepe recurvatis; corolla conspicua 3–6 mm. lata; nuculis homomorphis 4 (rare 1–2 abortis) ovatis acuminatis 2–2.5 mm. longis saepe granulatis basi truncatis margine rotundis vel obtusis ventre $^2/_5$–$^1/_2$ longitudinis ad gynobasem quadrangulari-columnarem ca. 1 mm. longam affixis; sulcis basem versus paullo gradatim ampliatis ad imam basem divaricato-furcatis et areolam triangularem profundam formantibus; stylo ca. 0.8 mm. longo quam nuculae evidenter breviori.

Known only from Mariposa County, California.

CALIFORNIA: Mariposa, April 27, 1898, *Congdon* (UC); Mariposa, May 1903, *Congdon* (UC); Mariposa County, May 2, 1890, *Congdon C59* (TYPE, Gray Herb.).

A peculiar plant with small, broad, thickish leaves and low, loosely branched, coarse, rigid stems. It has passed as *C. ambigua* and *C. barbigera* but is distinct from both, differing in its large corollas, low stiff habit, strigose stems and in the shape and attachment of the nutlets. In having basally truncate and acuminate nutlets it somewhat suggests *C. muricata*, var. *denticulata*, but is very different in its low habit, strigose pubescence and short style and gynobase. The young spikes are not so tawny as are those of *C. muricata.*

34. **C. crinita** Greene. Erectly branched herb 2–3 dm. high; stems appressed and spreading-hispid, branches numerous; leaves oblanceolate to oblance-linear, 2–4 cm. long, 2–4 mm. broad, obtuse, hirsute, evidently pustulate; racemes ternate or geminate, naked, 3–6 cm. long; corolla conspicuous, 3–5 mm. broad; fruiting calyces 5–6.5 mm. long, spreading, ovate-oblong, obscurely biserial, deciduous, divided, conspicuously villous, hairs very long and white, oldest calyces 5–10 mm. distant; pedicels well developed, 2–3 mm. long, long-villous; calyx-lobes linear, erect, slightly unequal, without a thickened midrib and pungent bristles; ovules 4; nutlet 1, next the axial calyx-lobe, ca. 3 mm. long, 1.3 mm. broad, erect, dull, brownish, ovate-lanceolate, densely muriculate-granulate, frequently coarsely tuberculate especially above the middle, apex attenuate, base obtusish, back convex, margin rounded or obtuse, groove opened towards base to form a small deep triangular areola; gynobase elongate, about half length of nutlet; style reaching to about ¾ height of nutlet.—Erythea iii. 66 (1895).

Known only from Shasta County, California.

CALIFORNIA: bed of Stillwater Creek at Leightone, 1900, *Baker* (G, UC); Cow Creek, 1894, *Baker & Nutting* (UC); Stillwater, *Nutting* (UC); Shasta County, 1894, *Baker & Nutting* (UC, "Dup. of type ').

Distinguished from all other members of the genus by its unusually long white hairs on the calyx and on the well developed pedicels. Very distinct from, but probably most related to, *C. Hendersoni.*

35. **C. excavata** Brandg. Loosely and ascendingly branched herb 1–2 dm. tall; stems short hispid-villous and usually appressedly so; leaves not numerous, 1.5–3 cm. long, 1–2 mm. broad, linear or spathulate-linear, obtuse, appressed-hispid, minutely pustulate, upper ones evidently reduced; spikes ternate or geminate, 3–8 cm. long, naked; corolla conspicuous, ca. 4 mm. broad; fruiting calyx, broadly ovate, 2–2.5 mm. long and nearly as wide, asymmetrical, sessile, spreading,

base rounded or very broadly conic, becoming remote and obscurely biserial; mature calyx-lobes lanceolate, subequal, erect or loosely connivent, frequently one displaced by the tip of the decumbent nutlet which they barely exceed in length, margin short hispid-villous, midrib scarcely thickened and somewhat short-hirsute; ovules 4; nutlet 1 and usually horizontal or infrequently 2–3 and then erect, ovate-triangular, recurved-acuminate, ca. 2.5 mm. long, densely granulate or granulate-muriculate, commonly sparsely tuberculate, base decidedly truncate, sides obtuse or rounded, back convex, groove dilated towards base and forming a broad deep narrowly triangular suprabasal areola; gynobase narrow, ca. 1 mm. long, about $\frac{1}{3}$–$\frac{1}{2}$ length of nutlet; style reaching to $\frac{2}{3}$–$\frac{3}{4}$ height of nutlets.—Bot. Gaz. xxvii. 452 (1899).

Inner North Coast Ranges of California; rare.

California: occasional on shelving slopes of sand, Cache Creek, Yolo Co., *Baker 2886* (G, UC); Lake County, April, *K. Brandegee* (UC).

The solitary, decumbent, triangular nutlet and short calyx are distinctive of this species. It appears to be related to *C. Hendersoni* on one hand, and apparently to *C. decipiens* on the other. No particular nutlet seems to develop, even in the same spike, for adjacent calyces may each develop its nutlet in a very different position relative to the spike-axis.

36. **C. Hendersoni** (Nels.) Piper. Ascendingly branched hispid herb 1.5–5 dm. tall; stems single or numerous, sparsely and loosely branched above, hispid; leaves oblanceolate or linear, 2–5(–7) cm. long, 2–5 mm. broad, acute or obtuse, appressed-hispid, lower ones somewhat persistent and pustulate, upper ones reduced; spikes usually ternate, rarely geminate or quadrinate, naked or at times bracted toward very base, 2–8 or rarely even 20 cm. long; corolla conspicuous, tube about equalling calyx, limb 4–7 mm. broad; fruiting calyx ovate-oblong or narrowly ovate, 3–6 mm. long, ascending, slightly asymmetrical, lowermost becoming obscurely biserial and distant, base rounded or broadly conic; pedicels ca. 0.5 mm. long; lobes lance-linear or linear, somewhat connivent above with herbaceous tips usually somewhat spreading, margins densely appressed villous-hispid, midrib obscurely thickened and hispid; nutlets 4 or by abortion rarely fewer, broadly ovate or very rarely lance-ovate, 2–2.8(–3) mm. long, smooth or more or less coarsely granulate, frequently coarsely tuberculate and at times finely papillate-muricate, back low convex, sides rounded or rarely obtuse, base rounded or somewhat truncate; groove

closed or very narrow, broadly forked below; gynobase narrow, ca. 1.3 mm. long, becoming ½–⅔ as high as nutlets; style reaching to about ⁴/₅ height of nutlets or barely exceeding them.—Piper ex J. C. Nelson, Torreya xx. 44 (1920). *Allocarya Hendersoni* A. Nelson, Erythea vii. 69 (1899); Piper, Contr. U. S. Nat. Herb. xxii. 113 (1920). *C. monosperma* Greene, Pittonia v. 53 (1902). *C. incana* Greene, Leaflets i. 79 (1904). *C. grisea* Greene, l. c. *C. trifurca* Eastw. Bull. Torr. Bot. Cl. xxxii. 203 (1905). *C. grandiflora* Rydb. Bull. Torr. Bot. Cl. xxxvi. 679 (1909). *C. Torreyana*, var. *grandiflora* Nels & Macbr. Bot. Gaz. lxi. 43 (1916). *A. dichotoma* Brand in Fedde, Repert. xviii. 313 (1922). *C. scabrella* Piper, Proc. Biol. Soc. Wash. xxxvii. 95 (1924).

Western Idaho to southwestern British Columbia and south to the Sierra Nevada and northern parts of California.

IDAHO: sandy hillsides in open places or amongst trees, Juliaetta, *Henderson 4815* (G); hills about Lewiston, *Henderson 2811* (G); Lewiston, 1895, *Piper* (G); about Lewiston, 450–600 m. alt., *Heller 2998* (UC); Valley of Clearwater River, *Sandberg, MacDougal & Heller 10* (G, ISOTYPE of *C. grandiflora*); Clearwater, *Spalding* (G); abundant all over wooded and unwooded hills, Palouse Country, *Henderson 2811* in pt. (G); lava soil slope, Big Willo, 900 m. alt., *Macbride 109* (G, UC). BRITISH COLUMBIA: Fort Vancouver, *Tolmie* (G). WASHINGTON: Wawawai, *Piper 1941* and *1944* (G); Tacoma, 1894, *Van Renselaer* (G); Steilacoom, *Piper 372* (G); Cape Horn, *Piper 5018* (G); Falcon Valley, *Suksdorf 456* (G) and *3278* (UC); dry hillsides, Columbia River, western Klickitat County, *Suksdorf 180* (UC, ISOTYPE of *C. monosperma*). OREGON: along Hood River, *Heller 10112* (UC); Lone Rock, 890 m. alt., *Leiberg 116* (G, UC); rocky bank, 1.6 km. north of Tonquin, *Nelson 3093* (G); Willamette River below Portland, *Sheldon S10866* (G); dry rocky bank by roadside, Coalca, *Nelson 2109* (G); rocky hillside, 5 km. north of McNary, *Nelson 2083* (G); dry open ground in Bush's Pasture, Salem, *Nelson 3253* (G); dry soil by roadside, 5 km. south of Salem, *Nelson 2166* (G); Bridge Creek, *Howell 501* (G); loose basaltic rock on wall of canyon, Silver Creek Falls, Marion Co., *Nelson 4869* (G); 3.2 km. east of Curry-Douglas county-line on trail from Marial to West Fork, *Peck 3995* (G); dry soil along trail, Marial, *Nelson 1414* (G); rocky woods, Elk Rock, *Nelson 1254* (G); dry soil along trail near mouth of Mule Creek, Curry Co., *Nelson 1369* (G); steep seaward slope, The Heads, Port Oxford, *Peck 8473* (G); Grant Pass, *Piper 5105* and *5106* (G); Grant Pass, *Piper 5043* (G, ISOTYPE of *C. scabrida*); Applegate, *Durden* (UC); near Stinking Water, 1200 m. alt., *Leiberg 2362* (G, UC); Steins Mt., *Howell 500* (G); adobe soil, Steins Mt. opposite Devines Ranch, 1500 m. alt., *Leiberg 2465* (G, UC); without locality, hillsides, 1881, *Howell* (G, part of TYPE of *A. dichotoma*). CALIFORNIA: Hupa Valley, 1900, *Manning* (UC); Hupa Indian Reservation, 150 m. alt., *Chandler 1302* (G, UC); mountain slopes along road between Three Creeks and mouth of Willow Creek, Humboldt Co., 750 m. alt., *Tracy 3335* (UC); in chaparral in hills about Scotts Valley, 420–600 m. alt., *Tracy 1744* (UC); between Mud Flat and Bennet Springs on Newville-Covelo road, *Heller 11928* (G); Hough's Spring, Lake Co., 1882, *Cleveland* (UC); southeast side of Snow Mt. above Bonnie View, *Heller 13236* (G); Rush Creek, Trinity Co., *Yates 402* (UC); Klamathon, *Copeland 3550* (G, ISOTYPE of *C. trifurca*); dry hills near Yreka, *Butler 733*

(UC) and *1416* (G, UC); Edgewood, 1887, *Curran* (UC); Siskiyou County, 1890, *Edmonds* (UC); along streams in meadows, Parker Creek, Warner Mts., 1650 m. alt., 1910, *Taylor & Bryant* (UC); Goose Lake Valley, 1884, *Austin* (UC); Milford, 1892, *Brandegee* (UC); Mormon Bar, 1897, *Congdon 50* (G); Salmon Creek, Tulare Co., 2100 m. alt., *Hall & Babcock 5132* (UC); Nine Mile Creek, Tulare Co., *Culberton 4537* (G, ISOTYPE of *C. incana*); Redrock Meadows, Tulare Co., 2610 m. alt., *Hall 8394* (UC). NEVADA: Reno, 1898, *Purpus* (UC); Dog Valley Road, 1895, *Hillman* (UC).

In northwestern United States, where this plant appears to be rather common, it is almost the only species of *Cryptantha* with conspicuous corollas. In the past it has been much confused with *C. ambigua* and *C. Torreyana*, although in fact it seems to be most closely related to *C. intermedia*. In Idaho it tends to intergrade with *C. Torreyana*, but over most of its range it is readily separated by its conspicuous corollas, commonly ternate spikes and usually tuberculate nutlets. Occasional plants are hard to separate from *C. ambigua* although *C. Hendersoni* is for the most part pretty easily recognized by its large-flowered, ternate spikes projected above the leafy mass of the plant. *Cryptantha intermedia* completely intergrades with *C. Hendersoni* in northern California, although the overwhelming mass of material of *C. Hendersoni* is readily distinguished from its relative by its less stiff and scarcely pungent pubescence, and broader tuberculate nutlets. It has been found expedient to admit considerable range of nutlet-variation in *C. Hendersoni*. Among plants quite similar in gross habit, and commonly from within a small natural region, the nutlets frequently (from plant to plant) vary from entirely smooth and shiny, to simply granulate or decidedly tuberculate. Roughly it can be said, however, that more of the northern than southern material is smooth-fruited. *Cryptantha incana* and *C. grandiflora* are names applied to the phase with smooth and shiny nutlets. The other names cited apply to forms with roughened fruit. *Cryptantha scabrella* was based on a phase of *C. Hendersoni* from southern Oregon in which the nutlets are papillate-muricate. *Cryptantha monosperma* has similar though less abundant and less well developed papillae, and appears to be a form in which only 1 or 2 nutlets develop. The aborted nutlets appear to be the abaxial ones.

37. **C. Traskae**, sp. nov., pumila sparse laxeque ramosa 8–10 cm. alta; caulibus gracilibus strigosis ca. 1 mm. crassis; foliis paucis linearibus 1–2 cm. longis 1–1.5 mm. latis acutis strigosis rare hispidis inconspicue pustulatis; spicis solitariis vel geminatis 1–5 cm. longis cum bracteis linearibus 2–5 mm. longis numerosis ornatis; floribus obscure biseriatis maturitate 5–10 mm. separatis; corolla inconspicua ca. 1.5

mm. lata; calycibus fructiferis ovatis subsessilibus deciduis 2–3 mm. longis; lobis calycis maturi lanceolatis saepe acutis in costa cum setis flavescentibus brevibus horridis et in marginibus adpresse hispidis; nuculis 4 homomorphis ovatis vel anguste ovatis vix 1.5 mm. longis minutissime granulatis apicem versus plus minusve tuberculatis dorso convexis margine obtusis ventre ¾ longitudinis ad gynobasim angustam ca. 0.9 mm. longam adfixis; sulcis clausis basi in areolam minutam deltoideam dilatatis; stylo nuculas vix superante.

Known only from San Nicolas Island off the Californian coast.

CALIFORNIA: one locality, bare windswept cliffs, San Nicolas Island, April, 1901, *Trask* (G, TYPE); infrequent on bare windswept heights, April 1897, *Trask 57* (UC).

This endemic of San Nicolas Island was reported by Eastwood, Proc. Calif. Acad. Sci. ser. 3, i. 109 (1898), as *C. Torreyana*. It is evidently quite distinct from that species in its low habit, pubescence, bracteate inflorescence and small tuberculate nutlets. In habit it somewhat suggests *C. leiocarpa*. Its nutlets are about the same size and shape as those of that species, but differ in being tuberculate and in having a broadly forked groove and a small areola.

38. **C. Torreyana** (Gray) Greene. Commonly scantily and more or less strictly branched hispid herb, 1–4 dm. tall; stems solitary or frequently several, usually inconspicuously short-strigose as well as hispid; leaves oblanceolate or linear, strict or ascending, 2–5(–7) cm. long, 3–6(–8) mm. wide, obtuse or rounded, hispid, inconspicuously pustulate if at all so; spikes usually geminate, naked, 4–8(–15) cm. long, more or less projected from the leafy mass of the plant, very elongate and loosely flowered or congested and glomerate; corolla inconspicuous, ca. 1 mm. broad; fruiting calyces oblong-ovate or ovate-lanceolate, 2–7 mm. long, ascending, asymmetrical, base rounded or broadly conic, pedicels ca. 0.5 mm. long; mature calyx-lobes lanceolate to lance-linear, connivent above with tips usually spreading, midrib slightly thickened and hispid-hirsute, margins hispid-strigose; nutlets 4 (occasionally 1 or more aborted), usually broadly ovate, 1.5–2.2(–2.5) mm. long, 0.8–1.3 mm. broad, smooth and polished, usually mottled, rarely finely granulate, back very low-convex, sides rounded or obtuse, groove broadly forked below and closed throughout; gynobase about ½ height of nutlets, ca. 1 mm. tall; style reaching to ⅔ height of nutlets or rarely even to their tips.—Pittonia i. 118 (1887).

Var. **genuina**. Fruiting calyx 3.5–8 mm. long; style clearly surpassed by nutlets; plants usually over 2 dm. tall, not conspicuously

hispid.—*Krynitzkia Torreyana* Gray, Proc. Am. Acad. xx. 271 (1885). *C. Torreyana* Greene, l. c. *K. Torreyana*, var. *calycosa* Gray, l. c. *C. Torreyana*, var. *calycosa* Greene, l. c. 119. *C. calycosa* Rydb. Mem. N. Y. Bot. Gard. i. 331 (1900). *C. affinis*, var. *flexuosa* Nels. Bot. Gaz. xxx. 195 (1900). *C. flexuosa* Nels. New Man. Bot. Cen. Rocky Mt. 416 (1909).

Extreme western Wyoming and northern Utah, westward to Washington and California, and northward through British Columbia to southern Alaska.

ALASKA: Skagway, *Macoun 78736* and *Eastwood 802* (G). BRITISH COLUMBIA: Lytton, 1885, *Fletcher:* dry ground, Spences Bridge, 1889, *Macoun* (G); Cascade, *Macoun 66580* (G). WYOMING: open dry slopes, Nez Perces Creek, *Nelson 6224* (G); under sagebrush, 32 km. west of Big Piney, *Payson 2628* (G); on cobblestone flat, Jackson Lake, *Nelson 6546* (G, UC, ISOTYPES of *C. affinis*, var. *flexuosa*); Teton Forest Reservation, 1897, *Brandegee* (UC); abandoned field, Alpine, *Payson & Armstrong 3392* (G); dry hillside, hills east of Afton, 1980 m. alt., *Payson & Armstrong 3324* (G). UTAH: waste sandy ground, Juab, *Goodding 1068* (G, UC); dry plains, Red Butte Canyon, *Garrett 1869* (G); Dry Canyon near Salt Lake City, 1908, *Clemens* (G); dry gravelly soil, Peterson, Weber River, 1950 m. alt., *Pammel & Blackwood 3895* (G). IDAHO: slightly moist shady slopes, Salmon, 1350 m. alt., *Payson 1756* in pt. (G); dry soil, St. Anthony, *Merrill & Wilcox 842* in pt. (G); arroyos, Pocatello, *Henderson 4877* (G); dry lands, Montpelier, *Macbride 1690* (G); moist grassy bottoms, Ketchun, 1764 m. alt., *Nelson & Macbride 1215* (G); about Lake Waha, *Heller 3255* (G); moist ground, Moscow, 1899, *Henderson* (G); valley of North Fork of Coeur d'Alene River, 930 m. alt., *Leiberg 1539* (G, UC); near Juliaetta, *Sandberg, MacDougal & Heller 351* (G); lava rock hillside, Tamarack, 1260 m. alt., *Clark 165* (G); Palouse Country, *Henderson 2811* in pt. (G); Snake Country, *Burke* (G); slopes, loose soil, Silver City, 2100 m. alt., *Macbride 373* (G). WASHINGTON: Sprangle, *Piper 4140* (G); Clark Springs, *Kreager 93* (G); Cheney, *Tucker 127* (G); Pullman, *Piper 1945* (G); Kamiak Butte, *Piper 3091* (G); Rock Lake, 540 m. alt., *Sandberg & Leiberg 121* (G, UC); dry stony hillsides, Blue Mts., 1897, *Horner* (G); dry hillsides along Touchet River, Blue Mts., *Horner 380* (G); open woods, Falcon Valley, *Suksdorf 789* (UC); Falcon Valley, *Suksdorf 593* (G); western Klickitat County, 1886, *Suksdorf* (G); Yakima Region, 1882, *Brandegee* (UC). OREGON: hillsides near Snake River, *Cusick 1913* (G, UC); dry ground, Rock Creek, 10 km. west of Haines, *Peck 3609* (G); dry woods on West Fork, *Peck 1369½* and *1416* (G); Pelican Bay, *Copeland 3481* (G); Klamath Falls road, 41 km. east of Ashland, *Peck 9295* (G); dry stony hilltop 3.2 km. southeast of Klamath Falls, *Peck 9447* (G); Grant Pass, *Piper 5044* (G). NEVADA: steep dry hillsides, Bieroth's Ranch, McDonald Creek, 1950 m. alt., *Nelson & Macbride 2151* (G); East Humboldt Mts., 2100 m. alt., *Watson 858* (G, UC); near Carson City, 1866, *Anderson 12* (G); Sprucemont, *Jones 6838* (UC); Incline Road, Lake Tahoe, 1890 m. alt., *Kennedy 1428* (UC); Peavine Foothills, 1895, *Hillman* (UC); foothills near Peterson's Ranch, Truckee Valley, 1894, *Hillman* (UC). CALIFORNIA: Hupa Indian Reservation, 150 m. alt., *Chandler 1303* (G, UC); Supply Creek, Hupa Valley, *Davy & Blasdale 5730* (UC); Kneeland Prairie, 750 m. alt., *Tracy 3071* (UC); High Prairie on Bald Mt., 1650 m. alt., *Tracy 4560* (UC); Afton, 30–90 m. alt., *Tracy 3655* (UC); open places on brushy slopes, 1650 m. alt., *Tracy 3944* (UC); dry hillside at Alder Point on Eel River, 150 m. alt., *Tracy 1879* (UC); Eel

River, 1893, *Blankinship* (UC); Ukiah, *Bolander 3916* (UC); gravelly slope about 16 km. east of Alder Springs, *Heller 11450* (UC); gravelly places, Alder Springs, 1260 m. alt., *Heller 12759* (G); gravel near trees, between Bartlett and Allen Springs, *Heller 12372* (G); Kelsey, 1889, *K. Brandegee* (UC); Camp Badger, 1892, *Holway* (UC); Snow Mt., 1892, *K. Brandegee* (UC); among chaparral, 10 km. northwest of Lakeport, *Tracy 1653* and *1731* (UC); moist shady ground, Lake County, *Rattan 42* (G); Napa Valley, *Torrey 330* (G); brushy places near stream, 13 km. above Ruth, Trinity Co., *Tracy 4301* (UC); Yreka, *Heller 7995* (G, UC); dry land near Yreka, *Butler 762* and *1310* (UC); Sisson, 1887, *Brandegee* (UC); Sisson, 1902, *Setchell & Dobie* (UC); Ager, 1887, *K. Brandegee* (UC); Fort Bidwell, *Manning 160* (UC); red gravelly hillside, Modoc Co., 1893, *Baker* (UC); Montgomery Creek, Shasta Co., *Eastwood 622* (G); Burney, *Eastwood 689* (G); Battle Creek Meadows, Lassen Butte Region, *Eastwood 1894* (G); Pine Creek, Lassen Co., 1894, *Baker & Nutting* (UC); ridge east of Red Clover Valley, Plumas Co., *Heller & Kennedy 8718* (G); Red Clover Valley, *Heller & Kennedy 8754* (G, UC); Prattville, *Heller & Kennedy 8773* (G, UC); open places in the chaparral near Cohasset, *Heller 11912* (G); open places in pine forest, Butte Meadows 1380 m. alt., *Heller 12818* (G); edge of forest about Chico Meadows, 1200 m. alt., *Heller 11642* (G); lower end of Donner Lake, *Heller 6888* (G, UC); Donner, 1889, *Brandegee* (UC); Truckee, 1913, *K. Brandegee* (UC); Placer County, 1892, *Carpenter* (UC); Angel Canyon, Calaveras Co., *Davy 1476* (UC); Yosemite Valley, *Torrey 337* (G); Yosemite Valley, *Bolander 6283* (UC); Yosemite Valley, *Hall 9168* (UC); Mariposa Big Tree Grove, 1893, *Eastwood* (UC); Mt. Bullion, 1889, *Congdon* (G); Sherlock's, *Congdon* (G, UC); Agua Fria Mt., 1898, *Congdon* (UC); Bloody Canyon, Mono Co., 1889, *Chestnut & Drew* (UC); Lost Valley, South Fork of San Joaquin River, 2280 m. alt., *Hall & Chandler 650a* in pt. (UC); Natural Bridge of Volcano Creek, 2250 m. alt., *Hall & Babcock 5439* (G, UC); Volcano Creek, *Culbertson 4327* (G); Old Colony Mill, Tulare Co., 1905, *K. Brandegee* (UC); Poso Creek, Greenhorn Range, *Hall & Babcock 5014* (G).

Var. **calistogae**, var. nov., varietatem genuinam simulans differt stylo nuculis subaequilongo vel rare eis longiore.

Vicinity of Calistoga, California, in the southern part of the North Coast Ranges.

CALIFORNIA: bushy hillside near Calistoga, 120 m. alt., *Tracy 1865* (UC); hills east of Calistoga, 240 m. alt., *Tracy 2094* (TYPE, U. C. Herb. no. 175,784); Santa Rosa Creek Canyon, *Baker 620* (UC); ? La Honda, 1890, *Brandegee* (UC).

Var. **pumila** (Heller), comb. nov. Fruiting calyx 2–3.5 mm. long; style shorter than nutlets; plant usually rather conspicuously hispid-hirsute, usually under 2 dm. tall.—*C. pumila* Heller, Muhl. ii. 242 (1906).

Middle Coast Ranges of California from Marin to Santa Clara County.

CALIFORNIA: Mt. Tamalpais, *Heller 8403* (G, ISOTYPE of *C. pumila*); Mt. Tamalpais, 1894, *Eastwood* (G); Tamalpais, 1893, *Brandegee* (UC); in brush at Sugar Loaf Peak, Berkeley Hills, 300 m. alt., *Tracy 2060* (G, UC); in shade, Strawberry Canyon, 150 m. alt., *Tracy 793* and *2054* (UC); wooded slope,

Smith Creek at foot of Mt. Hamilton, *Heller 8588* (G); foothills west of Los Gatos, *Heller 7458* (G, UC); shady hillside, Searsville, *Bolander 39* (G); without locality, *Kellogg & Harford 770* (G).

This species is at once the most widely distributed and the most northerly ranging of all the North American species. It has been generally accepted and well understood, being readily recognized by its erect loosely branched rather slender habit and broadly ovate smooth nutlets. Although it may intergrade with *C. Hendersoni*, possible intergrades are few and the ranges of the two species are such as to suggest specific difference. *Cryptantha Torreyana* differs from *C. Hendersoni* in having much smaller corollas, prevailingly geminate rather than ternate spikes, and always smooth rather than smooth or tuberculate nutlets. Except in California and Alaska *C. Torreyana* occurs in the dryish interior east of the high mounains, whereas *C. Hendersoni*, while occurring east of the mountains, is very common in the moister valleys of western Oregon and Washington.

Piper, Contr. U. S. Nat. Herb. xi. 484 (1906), has given the type locality of *C. Torreyana* as "Grassy hills near San Luis Rey, California," which is a locality quite beyond the known range of the species and in a region in which it is not to be expected. I have been unable to locate in the Gray Herbarium a collection of this species made by Torrey at the locality mentioned. There appear to have been only two of Torrey's collections of this species available to Gray. Gray based his species on a number of specimens and had no "type" in mind. If a type must be selected it seems better to choose either *Torrey 330* from Napa Valley, or preferably *Torrey 337* from Yosemite Valley since the latter is more characteristic of the species.

Most recent botanists, following Gray, have maintained the variety *calycosa*, a variation distinguished by its glomerate spikes and usually elongate calyx-lobes. This variation occurs throughout the range of the species, and although an obvious sort of variety seems to be a trivial one better treated as a mere *forma* or phase of the species worthy of no particular nomenclatorial attention.

In California the typical form of the species pushes southward along the length of the Sierra Nevada, the most southerly undoubted station being in Tulare County. In the herbarium of the University of California there is a specimen of *C. Torreyana* labeled as having been collected by G. F. Reinhardt in the San Jacinto Valley of Riverside County in Southern California. The data accompanying this specimen I doubt, since no other of the numerous collectors visiting the San Jacinto Valley has detected the species, and since the hot plains

and buttes about San Jacinto seem scarcely a likely locality for the southern outpost of a species which over most of its range in California is confined to the mountains and chiefly to the pine belt.

In the Coast Ranges of California the species occurs in its typical form as far south as Lake and Napa counties. Just south of these counties it is replaced by var. *calistogae* and var. *pumila*. Over its extensive range *C. Torreyana* is very constant in having styles evidently shorter than the nutlets. This condition is departed from in the available material from the vicinity of Calistoga, Sonoma County, California; the styles in this material clearly reaching to or slightly beyond the nutlet-tips. To this variation, because of its geographical correlation, the varietal name *calistogae* has been applied. The var. *pumila* is of different character. In the Middle Coast Range the plants representing *C. Torreyana* are more hispid and smaller in all parts. This plant has been confused with *C. leiocarpa* but is quite distinct, for, like the typical *C. Torreyana*, it differs in its broadly ovate nutlets, shorter style, and ebracteate spikes. Macbride, Contr. Gray Herb. n. s. xlviii. 43 (1916), confused the plant with *C. hirsutissima*, a close relative of *C. leiocarpa*. From *C. hirsutissima* the variety differs in its broad nutlets, somewhat shorter style, and different habit. Although the plant was described as a distinct species by Heller it is at most a weak geographical variety of *C. Torreyana* and perhaps not worthy of recognition at all.

39. **C. simulans** Greene. Erect strigose pallid herb with few strictly ascending branches, 1.5–3(–4.5) dm. high; scantily and loosely strigose or below rarely shortly and loosely appressed-hispid; leaves not numerous, oblanceolate or oblance-linear, 2–5(–7.5) cm. long, 2–5(–7) mm. wide, strigose, pustulate (especially the lower ones), frequently extending into the lowermost part of the spikes; cotyledons and early leaves frequently persistent at anthesis; spikes solitary or frequently geminate or ternate, slender, usually elongate and sparsely flowered but at times glomerate; corolla inconspicuous, ca. 2 mm. broad; fruiting calyx 3–8 mm. long, oblong-ovate, slightly asymmetrical, strict or ascending, obscurely biserial, base rounded or broadly conic, pedicels ca. 0.5 mm. long; mature calyx-lobes lance-linear, connivent above with the green tips spreading, midrib slightly thickened and shortly arcuate-hirsute, margins white villous-hispid; nutlets 4, homomorphous, broadly ovate, 2–2.5 mm. long, 1–1.5 mm. broad, densely granulate or granulate-muriculate, sparsely broad-tuberculate, back low-convex, margins rounded, groove broadly forked below and usually closed throughout; gynobase ca. 1–1.5 mm. high; style reaching to about $^{3}/_{4}$–$^{4}/_{5}$ height of nutlets.—Pittonia v. 54 (1902).

In the pine forests from southern Oregon to Southern California, and local in northern Idaho and middle southern Washington.

IDAHO: dry pine woods, Mt. Moscow, *Henderson 2811½* (G). WASHINGTON: open woods, Falcon Valley, *Suksdorf 46* and *595* (G), *181* (UC). OREGON: Klamath Valley, 1260 m. alt., 1864, *Cronkhite* (G); summit of Cascade Mts., along Ashland-Klamath Falls road, *Peck 9264* (G); without locality, 1883, *Howell* (UC). NEVADA: Incline Road, Lake Tahoe, 1890 m. alt., *Kennedy 1446* (UC); Kings Canyon, Ormsby Co., 1700–2000 m. alt., *Baker 1194* (G, UC); Dog Valley Road, 1895, *Hillman* (UC); log railroad north of Verdi, 1590 m. alt., *Heller 10873* (G, UC). CALIFORNIA: in coniferous forests near Sisson, *Heller 8035* (G); Goose Valley, *Eastwood 765* (G); Milford, 1892, *Brandegee* (UC); Prattville, *Heller & Kennedy 8776* (G); Prattville, 1892, *Brandegee* (UC); American River at Strawberry, 1650 m. alt., *Hall 11388* (G); Truckee, *Heller 7060* (G, UC); Placer County, 1892, *Carpenter* (UC); Jackson, 1892, *Hansen* (UC); beneath pines in vicinity of Hog Ranch, Yosemite Park, *Hall & Babcock 3318* and *3444* (UC); Hog Ranch above Hetch-Hetchy, *Congdon 51* (G); Yosemite Valley, 1200–1350 m. alt., *Abrams 4379* (UC) and *4471* (G, UC); Fortman Mt., Mariposa Co., 1885, *Congdon* (UC); Mt. Buckingham, 1898, *Congdon* (UC); Calaveras Big Tree Groove, 1891, *Brandegee* (UC); foothills of Fresno County, 900 m. alt., *Hall & Chandler 56* (UC); Jordan Hot Springs on Nine-mile Creek, 2010 m. alt., *Hall 8393* (UC); Giant Forest, 1905, *Brandegee* (UC); Sequoia Mills, 1892, *Brandegee* (UC); Sportsman Hall, Fyffe P. O., 20 km. above Placerville, *K. Brandegee* (UC); Region of Tehachapi Peak, *Dudley 347* (UC); open pine woods, Mt. Wilson, *Abrams 2578* (G, UC); Swarthout Canyon, 1800 m. alt., 1900, *Hall* (UC); Lytle Creek Canyon, 1725 m. alt., 1899, *Hall* (UC); Lytle Creek Canyon, 1725 m. alt., *Hall 1230* (UC); on dry gravelly canyon-floor, Coldwater Fork of Lytle Creek, 1725 m. alt., *Johnston 2035* (G); dry rocky ground under pines, Icehouse Canyon, 1650 m. alt., *Johnston 2035* (G); San Bernardino Mts., 1800 m. alt., 1899, *Hall* (UC); brushy places, Tahquitz trail above Idyllwild, 2100 m. alt., *Spencer 2117* (G); Onstatt Valley, 1500 m. alt., 1901, *Hall* (UC); Cuyamaca Peak, 1894, *Brandegee* (UC); Southern California, 1880, *Wright 11* (G); southeastern California, 1876, *Parry & Lemmon 279½* (G); Southern California, 1888, *Palmer 41* (G).

This readily recognized species, so characteristic of the Yellow Pine forests of California, has passed as *C. ambigua*, although very different from the low hispid plant of the Northwest properly bearing that name. The pallid strigose pubescence and the broad granulate and tuberculate nutlets readily distinguish it from *C. Torreyana* with which it grows and somewhat approaches in habit.

40. **C. ambigua** (Gray) Greene. Ascending hirsute herb 1–2.5 dm. tall; stems usually loosely branched from the base, hirsute and somewhat short-strigose; leaves narrowly lanceolate to linear, 2–3(–5) cm. long, 1–4(–5) mm. broad, obtuse or subacute, usually somewhat appressed hispid-hirsute, commonly inconspicuously pustulate; spikes usually solitary, 5–15 cm. long, naked or with the lowermost flowers bracted, commonly not projected clear of the leafy mass of the plant and usually not sharply differentiated from the leafy peduncular

branches; corolla inconspicuous, 1–2 mm. broad; fruiting calyces ovate-oblong or oblong, 4–7 mm. long, slightly asymmetrical, spreading, crowded or distant and obscurely biserial, base rounded or broadly conic; pedicels 0.5–0.9 mm. long; mature calyx-lobes linear or lance-linear, usually more or less connivent above, midrib slightly thickened and tawny hirsute, margins evidently short strigose-villous, nutlets 4, broadly ovate, 1.6–2 mm. long, granulate and coarsely tuberculate or very rarely tending to be smooth especially towards base, back low convex, sides obtuse and rounded, groove closed or rarely somewhat dilated but always broadly forked at base; gynobase narrow, 1–1.2 mm. long, ⅔ height of nutlets; style reaching $^4/_5$–$^5/_5$ height of nutlets.—Pittonia i. 113 (1887). *Eritrichium muriculatum*, var. *ambiguum* Gray, Synop. Fl. N. Am. ii. pt. 1, 194 (1878). *Krynitzkia ambigua* Gray, Proc. Am. Acad. xx. 273 (1885). *Eritrichium muriculatum* of Torr. Bot. Wilkes Exped. 416, t. 13 (1874). *C. polycarpa* Greene, Pittonia i. 114 (1887). *C. multicaulis* Nels. Bot. Gaz. xxx. 194 (1900).

Southern Washington to southwestern Montana and thence southward to northern Colorado, extreme western Nevada and northeastern California.

MONTANA: mountains near Indian Creek, *Rydberg & Bessey 4885* (G); Spanish Basin, *Rydberg & Bessey 4886* and *4887* (G); canyon from Rose Hole to Bitterroot Valley, *Watson 286a* (G, UC); Bridger Mts., *Rydberg & Bessey 4889*. WYOMING: on dry loose soil of a road-grade, Snake River, *Nelson 6440* (G, ISOTYPE of *C. multicaulis*); on steep slopes of river-bank, Yellowstone River near Junction Butte, *Nelson 5761a* (G); under granite cliff, Cow Creek, Albany Co., *Nelson 8888* (G); dry loose soil, Centennial, *Nelson 8731* (G). COLORADO: mountain side near Georgetown, 1885, *Patterson* (G). IDAHO: roadside, Bear Creek below Parker Mt., 1800 m. alt., *Macbride & Payson 3305* (G); sagebrush covered hillside, Corral, 1650 m. alt., *Macbride & Payson 2936* (G); abandoned field, Martin, 1800 m. alt., *Macbride & Payson 3044* (G); dry hills, Castle Rock, 1500 m. alt., *Macbride & Payson 2861* (G); Boise, 1892, *Mulford* (G); dry soil, 1650 m. alt., Twilight Gulch, *Macbride 465* (G); loose dry soil, House Creek, *Nelson & Macbride 1773* (G); dry soil, St. Anthony, *Merrill & Wilcox 842* in pt. (G). UTAH: Thistle, 1590 m. alt., *Jones 5370* (UC). NEVADA: upper end of Star Valley near Deeth, 1680 m. alt., *Heller 9074* (G); Franktown, 1500 m. alt., *Heller 9794* (G); Galena Creek, 2400 m. alt., *Kennedy 1293* (UC); Lake Washoe, *Torrey 335* (G); Palisade, 1903, *Stokes* (UC). WASHINGTON: north of Brickleton, *Suksdorf 406* (G); White Salmon, *Suksdorf 594* (G); Klickitat, *Howell 337* (G); Walla Walla Region, 1883, *Brandegee* (UC); Washington Territory, 1883, *Brandegee 994* (G). OREGON: dry ground, Sisters, *Peck 3607* (G); Bend, *Nelson 851* (G, UC); dry slope along Des Chutes River 8 km. below Bend, *Peck 9710* (G); Stein's Mt., *Howell 498* and *499* (G); in sagebrush, Swan Lake Valley, *Applegate 370* (G). CALIFORNIA: Portola, *K. Brandegee* (UC); lake shore, Modoc Co., *Austin & Bruce 2267* (UC); ice pond below Truckee, 1887, *Sonne* (UC, ISOTYPE of *C. polycarpa*).

In the past this species has been greatly confused and the name has been used in a variety of applications. The plant treated here is that figured and described by Torrey in the Botany of the Wilkes Expedition, 416, t. 13 (1874), since Gray appears to have based his *Eritrichium muriculatum*, var. *ambiguum* largely upon Torrey's plate and description. Torrey gives his plant as from Nisqually, but since it represents a species characteristic of the dry interior of Washington it seems likely that, as with other material collected by the Wilkes Expedition, the data had become confused and the plant was probably collected in the Walla Walla Region of southeastern Washington, cf. Piper, Contr. U. S. Nat. Herb. xi. 15 (1906).

Although usually distinguishable by its habit, *C. ambigua* approaches *C. Kelseyana* and *C. Pattersoni* very closely in Idaho and Wyoming, and is occasionally distinguishable from them only with difficulty. Doubtful intermediate plants with homomorphous or subhomomorphous nutlets I have referred to *C. ambigua* even though some so referred have one nutlet subpersistent and occasionally somewhat less tuberculate than the others. Some plants from Idaho referred to *C. ambigua* have nutlets smooth quite like those of *C. Torreyana*. These plants are so referred because their habit is that of *C. ambigua*. *Cryptantha Hendersoni* usually agrees with *C. ambigua* in the size, shape and roughenings of the nutlets, but has a very different habit and inflorescence.

41. **C. echinella** Greene. Usually low and loosely branched hispid herb 5–20 or rarely 40 cm. tall; stems short-hispid, sparsely branched; leaves oblanceolate or oblance-linear, 1–2.5(–4.5) cm. long, 1–4(–6) mm. broad, obtusish, appressed-hispid, minutely pustulate, not numerous; spikes solitary or at times geminate, 1–5 cm. long, slender, commonly leafy-bracted towards base; corolla inconspicuous, 1–1.8 mm. broad; fruiting calyx oblong-ovate, 5–6 mm. long, deciduous, spreading, obscurely biseriate; pedicels 0.1–0.5 mm. long; mature calyx-lobes linear-lanceolate, connivent above and usually recurved, midrib slightly thickened and pale-tawny hirsute, margins appressed short-hispid; nutlets 4, homomorphous, broadly ovate, 2–2.2 mm. long, more or less finely granulate, conspicuously and narrowly papillate, back convex, margin rounded, groove very narrow or closed and widely forked at base; gynobase about ⅔ height of nutlets; style shortly but definitely surpassed by tips of nutlets.—Pittonia i. 115 (1887).

Central Sierra Nevada to the mountains of Southern California and the Charleston Mts. of southern Nevada.

NEVADA: Densmore Camp, Hunte Creek Canyon, 1800 m. alt., *Kennedy 1606* in pt. (UC); Peterson's Ranch near Reno, 1894, *Hillman* (UC); Peavine Foothills, 1895, *Hillman* (UC); Charleston Mts., *Purpus 6077* (UC). CALIFORNIA: Mt. Stanford, 2640 m. alt., 1886, *Sonne* (UC, ISOTYPE); Castle Peak near highest point, *Heller 7079* (G); Tahoe, 1901, *Boring* (UC); Lake Tahoe Region, 1901, *Setchell & Dobie* (UC); Luthers Pass, 2340 m. alt., *Abrams 4759* (G); Yosemite Valley, 1200–1350 m. alt., *Abrams 4379* in pt. (G); dry situations, Yosemite Valley, *Brewer 6284* (UC); Alta Meadows, 1905, *K. Brandegee* (UC); Andrews Camp above Bishop, 1913, *K. Brandegee* (G, UC); sawmill, Mt. Pinos, 2490 m. alt., *Hall 6523* (UC); rocky ground under pines, Prairie Fork of San Gabriel River, 2100 m. alt., *Johnston 2071* (G); on flats, Kelly's Cabin, Ontario Peak, 2460 m. alt., *Johnston 1620* (G, UC); dry ridge east of Ontario Peak, 2520 m. alt., *Munz 6076* (UC); Coldwater Fork of Lytle Creek, 1725 m. alt., *Johnston 2057* in pt. (G); Mare Flat, 2400 m. alt., *Crawford 934* (G); Little Green Valley, 2160 m. alt., *Hall 24* (UC).

This characteristic species has been greatly misunderstood, and repeatedly confused with *C. ambigua* and *C. intermedia*. It grows in dry sunny clearings in the Yellow Pine belt of the California mountains usually in the company of *C. simulans*, *C. affinis* and *C. Torreyana*.

Ser. X. MOHAVENSES. Nutlets 4, smooth, oblong-ovate or lanceolate-ovate or lanceolate, clearly angled at the sides, decidedly homomorphous; style usually equalling height of nutlets or shorter than latter.

Corolla conspicuous; style clearly surpassing the nutlets, these 2–2.5 mm. long.....42. *C. mohavensis.*
Corolla inconspicuous; style about equalling the nutlets in height or a trifle surpassed by them; nutlets 1.2–2 mm. long.....43. *C. Watsoni.*

42. **C. mohavensis** Greene. Ascendingly branched herb 1–4 dm. tall; stems usually freely branched, short-hispid to hispid strigose; leaves linear or lance-linear, 1–4 cm. long, 1–3 mm. broad, appressed-hispid or strigose, minutely and densely pustulate, obtusish, upper ones reduced; spikes ternate or geminate, usually crowded, 2–6 cm. long, naked; corolla conspicuous, 4–7 mm. broad; fruiting calyces oblong-ovate, 3–5 mm. long, ascending, becoming obscurely biserial, symmetrical, base rounded, deciduous, pedicels ca. 0.5 mm. long; mature calyx-lobes lanceolate, connivent above, midrib somewhat thickened and frequently sparsely hirsute, margins usually more or less silky strigose; nutlets 4, homomorphous, smooth and shiny, rarely obscurely granulate, oblong-ovate or lance-ovate, 2–2.5 mm. long, back low-convex or flattish, margins definitely angled especially towards the apex, groove closed above but forked below and opened at the fork to form a small triangular areola; gynobase columnar-subulate, about ¾ height of nutlets; style clearly surpassing tips of

nutlets.—Pittonia i. 120 (1887). *Krynitzkia mohavensis* Greene, Bull. Calif. Acad. Sci. i. 207 (1885).

Southern Sierra Nevada of California, best known from the vicinity of Tehachapi Mountains.

California: Andrews Camp, mountains above Bishop, 1913, *K. Brandegee* (G, UC); sand hills near Pampa Station, *Heller 7642* (G); Water Canyon, Tehachapi Mts., 1800 m. alt., *Abrams & McGregor 474* (G); between Mohave and Cameron, 1905, *K. Brandegee* (UC); Mohave Desert, 1884, *Curran* (G, isotype).

In habit quite similar to *C. oxygona*, and like that species much suggesting *C. muricata* in gross aspect. Although having smooth, wingless nutlets it seems very closely related to *C. oxygona*.

43. **C. Watsoni** (Gray) Greene. Slender strictly branched hispid herb 1–3 dm. high; stems solitary, sparsely to loosely branched, spreading short-hispid; leaves linear to oblanceolate, 1–4(–5) cm. long, 1–4(–5) mm. wide, obtuse or rounded, ascending, hispid and rarely pustulate; spikes solitary or geminate, 1–4(–6) cm. long, occasionally leafy-bracted below; corolla inconspicuous, ca. 1 mm. broad; fruiting calyx ovate or oblong-ovate, 2–3.5(–4) mm. long, subsessile, rounded at base, early deciduous, oldest ones becoming distant; mature calyx-lobes lanceolate, tips usually connivent, midrib hispid and scarcely thickened, margins appressed short-hispid; nutlets 4, homomorphous or practically so, lanceolate, 1.5–2 mm. long, ca. 0.8 mm. broad, smooth, shiny or at times dulled by minute granulations, back nearly flat, margins definitely angled, groove closed or nearly so and forked at base; gynobase subulate, ca. ⅔ height of nutlets; style equalling nutlets or a trifle surpassed by them.—Pittonia i. 120 (1887). *Krynitzkia Watsoni* Gray, Proc. Am. Acad. xx. 271 (1885). *C. vinctens* Nels. & Macbr. Bot. Gaz. lxii. 143 (1916).

Eastern Washington to western Montana, southward to Nevada and northern Colorado.

Montana: Canyon Ferry, 1898, *Brandegee 30* (UC). Wyoming: steep slopes of river banks, Yellowstone River near Junction Butte, *Nelson 5761* (G); Centennial Hills, *Nelson 1684* (G, UC); Point of Rocks, *Nelson 3080* (G, UC); Gorfield Peak, *Nelson 672* in pt. (UC); Rocky Mts., *Nuttall* (G). Colorado: along railroad tracks near Hot Sulphur Springs, Middle Park, 2280 m. alt., *Ramaley & Robbins 3575* (UC). Idaho: loose disturbed soil near road, Challis, 1620 m. alt., *Macbride & Payson 3222* (G); dry granite slopes, Mackay, 1750 m. alt., *Nelson & Macbride 1527* (G, UC); sandy slopes New Plymouth, 660 m. alt., *Macbride 81* (G, UC). Utah: Wasatch Mts., 1800 m. alt., *Watson 858* (G, type of *K. Watsoni*). Nevada: canyon on southwest base of Mt. Grant, 1410 m. alt., *Heller 10905* (G, UC); Mesia near Goldfield, *Heller 10970* in pt. (G, UC); Tonopah, 1800 m. alt., *Shockley 81* (UC). Washington: junction of Crab and Wilson creeks, 390 m. alt., *Sandberg &*

Leiberg 249 (G, UC). OREGON: dry ground, Narrows, *Peck 3587* (G); Juniper Springs, 1350 m. alt., *Leiberg 2271* (G, UC); rocky slopes, Mathew Valley near Harper's Ranch, 1100 m. alt., *Leiberg 2235* (G, TYPE of *C. vinctens*; UC, ISOTYPE); clay banks, Mathew Butte, 750 m. alt., *Leiberg 2041* (G).

An interesting species characterized by its four, lanceolate, angled nutlets and well developed style. Although it has been confused with *C. gracilis* it is really quite distinct from that plant in the angling and number of nutlets, length of style, and shape and pubescence of calyx. *Cryptantha vinctens* is a peculiar form of this species having somewhat appressed-pubescent and inconspicuously hispid calyces. The segregate is not separated geographically, and appears to be merely an extreme form whose characters of pubescence are rather completely obliterated by transitional forms clearly referable to *C. Watsoni.*

Ser. XI. GRACILES. Nutlets 1 or rarely 2, smooth, lanceolate, laterally rounded or obtuse, subhomomorphous, axial one always developing and in general slightly larger than the second nutlet when that develops; style reaching to ⅔–¾ height of nutlet.

44. **C. gracilis** Osterh. Slender erectly branched herb 1–2 dm. high; stems usually solitary, sparsely branched, densely spreading short-hispid; leaves not numerous, linear to narrowly oblanceolate, 1–3 cm. long, 1–3 mm. broad, obtuse or rounded, ascendingly short-hispid, usually minutely pustulate, upper leaves reduced; spikes solitary or geminate, usually dense, 1–2 cm. long, naked; corolla inconspicuous, limb 0.6–1 mm. broad; fruiting calyx ovate, divaricate, 2–2.8 mm. long, promptly deciduous, base decidedly conical, sessile; mature calyx-lobes lanceolate, rather densely appressed tawny hispid-villous, tips erect, midrib slightly thickened and inconspicuously short-hispid; nutlets 1 or rarely 2–3 and then more or less unequally developed, lanceolate, 1.5–2 mm. long, ca. 0.8–1 mm. broad, smooth and shiny, acute, back nearly flat, sides rounded at least towards apex, groove usually opened to above middle and scarcely forked below; gynobase ca. ½ height of nutlet; style reaching to ⅔–¾ height of nutlet.—Bull. Torr. Bot. Cl. xxx. 236 (1903). *C. Hillmanii* Nels. & Kenn. Proc. Biol. Soc. Wash. xix. 157 (1906). *C. gracilis*, var. *Hillmanii* Munz & Johnston, Bull. Torr. Bot. Cl. xlix. 39 (1922).

Southern Idaho and eastern Colorado to northern Arizona and southeastern California.

IDAHO: plains of the Snake River, *Palmer 72* (G, UC); without locality, *Henderson 2561* (G). COLORADO: Glenwood Springs, 1920, *Osterhout* (G); dry mesa among junipers, Nucla, 1800 m. alt., *Payson 395* (G). UTAH:

Gold Hill, 1891, *Jones* (UC); without locality, 1875, *Ward 1231* (G). NEVADA: Palmetto Range, *Purpus 5921* (UC); near Reno, 1894, *Hillman* (UC); Candelaria, *Shockley* (UC); Mesia west of Goldfield, 1860 m. alt., *Heller 10970* (G). ARIZONA: Ash Fork, *Rusby 747* (UC); Grand Canyon, 2100 m. alt., *Mac Dougal 184* (G, UC); Grand Canyon, *Macbride & Payson 947* (G); El Tovar, Grand Canyon, 1907, *Setchell* (UC). CALIFORNIA: near Bonanza King Mine, Providence Mts., *Munz, Johnston & Harwood 4222* (UC); Barnwell, *K. Brandegee* (UC); Silver Canyon near Laws, *K. Brandegee* (UC).

This is a very distinct species and is scarcely to be confused with any other once its characters are understood. The calyx is notably conical at the base, densely covered with short appressed hairs, and apparently lacking pungent hairs on the lobes. One nutlet commonly develops; this is obscurely if at all angled on the edges; and evidently surpasses the style. Occasionally two or even three nutlets are matured, and then they appear to be unequal in length and development. The normal and fully developed nutlet is always near the axial calyx-lobe.

Ser. XII. RAMULOSISSIMAE. Nutlets 4, smooth, lanceolate, laterally rounded or obscurely angled, practically homorphous but with the axial one minutely and obscurely though definitely larger than the others and always present when for any reason less than the normal number develop; style reaching the tips of the nutlets or barely surpassed by them.

45. **C. Fendleri** (Gray) Greene. Herb 1–5 dm. high, usually with a definite straight erect axis (commonly simple below but producing numerous ascending laterals above), more or less densely hispid and frequently appressedly so; leaves narrowly oblanceolate, acute, 2–5 cm. long, 2–4 mm. broad, appressed-hispid, frequently pustulate beneath; spikes solitary or geminate, 2–12 cm. long, sparsely if at all bracteate, loosely flowered; corolla inconspicuous, ca. 1 mm. broad; fruiting calyces ovate-oblong, 4–5(–7) mm. long, ascending, slightly asymmetrical, obscurely biserial; pedicels ca. 0.5 mm. long; mature calyx-lobes linear to lance-linear, usually loosely connivent with the tips somewhat spreading, midrib thickened and hirsute, margins strigose; nutlets homomorphous, 4 (exceptionally with 1–3 aborted, but then the axial nutlet always present), smooth, somewhat shiny, lanceolate, acuminate, 1.5–2 mm. long, back convex, sides rounded or obscurely obtuse, groove closed or nearly so but at base opening into a definite deltoid areola; gynobase subulate, twice length of style, at least ⅔ height of nutlets; style equalling or barely surpassing the nutlets.—Pittonia i. 120 (1887). *Krynitzkia Fendleri* Gray, Proc. Am. Acad. xx. 268 (1885). *Eritrichium hispidum*, var. *leiocarpum*

Kuntze, Rev. Gen. ii. 437 (1891). *C. ramulosissima* Nels. Erythea vii. 68 (1899). *C. wyomingensis* Gandoger, Bull. Soc. Bot. France lxv. 62 (1918).

Southern Alberta and Saskatchewan to eastern Nebraska, northern New Mexico and Arizona; also in eastern Washington and western Nevada.

ALBERTA: Hand Hills, *Macoun 165* (G). SASKATCHEWAN: Crane Lake, *Macoun 5804* (G). WYOMING: sandy dry bottom lands, Dunn's Ranch, *Nelson 7611* (G); sandy plains, Laramie, *Nelson 6886* and *7670* (G); Laramie, *Nelson 5275* (G, UC, ISOTYPES of *C. ramulosissima*); Pine Bluff, *Nelson 3510* (G); Sherman 1878, *Phillips & Sargent* (G); Cummins, *Nelson 1523* (G, UC, ISOTYPE of *C. wyomingensis*). NEBRASKA: sandy prairie, Dismal River south of Thedford, *Rydberg 1429* (G). COLORADO: dry places in Clear Creek Canyon, Georgetown, *Patterson 112* (G, UC); common on plains, Denver, *Eastwood 50* (G, UC); Denver, 1872, *Porter* (G); Rocky Mts., lat. 40°–41°, 1868, *Vasey 434a* (G); Rocky Mts., lat. 39°–41°, 1862, *Hall & Harbour 434* in pt. (G); Colorado Springs, 1873, *Greene* (G, UC); Sierra Mojado, 1877, *Brandegee* (UC); Fort Garland, 1867, *Parry* (G); Salida, *Osterhout 3425* (G); Gunnison, *Baker 780* (G). NEW MEXICO: between Santa Fe and Canoncito, 2190 m. alt., *Heller 3786* (G); without locality, 1847, *Fendler* (G, TYPE of *K. Fendleri*). UTAH: Montezuma Canyon, east of Monticello, *Rydberg & Garrett 9681* (G); sandy soil, La Sal Mts., *Purpus 6610* (UC); below Thurber, *Jones 5648* (UC). ARIZONA: Cosnino, *Rusby 750* (G); openings in yellow-pine forest, east base of San Francisco Mts., 2190 m. alt., 1920, *Hall* (G); Flagstaff, 1894, *Toumey* (UC); San Francisco Mts., 1884, *Lemmon* (UC); sand dunes, Navaho Reservation, *Vorhies 124* (G, UC). WASHINGTON: drifting sand, Pasco, *Piper 2951* (G); without locality, *Henderson 2562* (G). NEVADA: Palisade, *Brandegee* (G).

Cryptantha Fendleri is the most easterly ranging of the smooth-fruited series of *Cryptantha*. In its common typical form the erect habit and paniculate branching are very characteristic, and as a general thing the species has been well understood. A diffusely branched form from southern Wyoming has been described as *C. ramulosissima*. In floral and fruiting structures this form is quite indistinguishable from typical *C. Fendleri*. Similar material has been collected in eastern Washington. The range of *C. Fendleri* seems somewhat discontinuous. Its roots are frequently charged with a purple dye. The three extra-Californian species with narrow, smooth and more or less shiny nutlets may be distinguished as follows,—

Calyx broadly conical at base, densely appressed hispid-villous, lacking conspicuous bristles; nutlets 1; style 2/3–3/4 height of nutlets.....*C. gracilis.*

Calyx rounded at base, hispid or hirsute, inconspicuously strigose along margins; nutlets 4; style about equalling nutlets.

Nutlets evidently angled at the margin; groove closed throughout; leaves obtuse or rounded; plant without a straight vertical axis.....*C. Watsoni.*

Nutlets with margins rounded or somewhat obtusish, groove opened at base to form an areola; leaves acute; plant usually with a stiffly erect straight axis.....*C. Fendleri.*

Ser. XIII. LEIOCARPAE. Nutlets 1–4, smooth, ovate or somewhat lanceolate, laterally rounded or obtuse, homomorphous with the abaxial one always developing; style reaching to ¼ height of nutlets or barely surpassing them; calyx-lobes hirsute with straight hairs.

Style reaching to the tips of the nutlets or barely surpassing them.
Nutlets ovate with a subsimple groove; spikes decidedly bracteate.....46. *C. leiocarpa.*
Nutlets ovate-oblong, usually with a forked groove; spikes naked.....47. *C. hispidissima.*
Style reaching to 1/4–3/4 height of nutlets.
Style reaching to 1/4–1/2 height of nutlets.....48. *C. microstachys.*
Style reaching to 2/3–3/4 height of nutlets.
Hairs on upper part of calyx-lobes conspicuously retrorse. 49. *C. nemaclada.*
Hairs on calyx spreading or ascending.
Spikes naked.....50. *C. Clevelandi.*
Spikes bracted.
Corolla less than 1 mm. broad; diffuse prostrate plants.....51. *C. Brandegei.*
Corolla 1.5–2 mm. broad; sparsely branched erect plants.....52. *C. Abramsii.*

46. **C. leiocarpa** (F. & M.) Greene. Laxly branched usually decumbent or prostrate herb; branches usually long and numerous, hispid-strigose or frequently loosely appressed-hispid, becoming 1–4 dm. long; leaves oblance-linear to oblanceolate, strigose-hispid and often sparsely hispid, occasionally pustulate, obtuse or rounded or rarely emarginate, 1–2.5(–4) cm. long, 1–4(–9) mm. broad; spikes solitary or geminate or rarely ternate, becoming 6 cm. long but usually shorter, conspicuously leafy-bracted, not at all sharply differentiated from the mass of the plant; corolla usually inconspicuous, limb 1–2.5(–3.5) mm. broad; fruiting calyces ovate to oblong-ovate, 2–3 mm. long, usually ascending, tardily deciduous, subsessile, usually crowded or becoming loose below, subsymmetrical; mature calyx-lobes lance-linear, loosely connivent above, midrib somewhat thickened and usually decidedly tawny-hirsute, margins strigose; nutlets 4 or very rarely fewer by abortion, oblong-ovate to ovate, 1.6–2 mm. long, smooth, polished or minutely granulate and dull, back convex, margins obtuse, face convexo-obtuse, groove closed and very shortly forked at base if at all; gynobase subulate, ⅔–¾ height of nutlets; style equalling or slightly surpassing the tips of the nutlets.—Pittonia i. 117 (1887). *Echino-*

spermum leiocarpum F. & M. Ind. Sem. Hort. Petrop. ii. 36 (1835). *Krynitzkia leiocarpa* F. & M. l. c. vii. 52 (1841). *Eritrichium leiocarpum* Wats. Bot. King Exped. 244 (1871).

Along the ocean beach from southern (Curry County) Oregon to (Santa Barbara County) Southern California.

Oregon: beach, Gold Beach, *Peck 8691* (G); beach near Harbor, *Peck 8755* (G); Chetco, *Howell 222* (G). California: sand dunes of ocean beach, Humboldt Bay, *Tracy 2457* (G, UC); Bodega Point, *Eastwood 4815* (G); Bodega Bay, *Heller 5615* (G); Point Reyes, 1886, *Curran* (UC); San Francisco, 1895, *Davy* (UC); Golden Gate Park, San Francisco, 1881, *Jones* (UC); Lake Merced, 1901, *Jones* (UC); Presidio, San Francisco, 1894, *Eastwood* (UC); Monterey, 1883, *Parry* (G); Point Pinos, *K. Brandegee* (UC); Morro, *Barber* (UC); Casmaila Station, *K. Brandegee* (UC); Antonio Station, *K. Brandegee* (UC); Surf, 1909, *K. Brandegee* (G); Surf, 1909, *K. Brandegee a, b, c* (UC).

This is a very well marked coastal species, but has been greatly misinterpreted in the past and at various times made to include nearly all the smooth-fruited species of the genus. Study of material in the Gray Herbarium which was raised from authentic seeds received from St. Petersburg, Hamburg and Geneva, shows clearly that the name should be applied to the sea-shore plant of middle and northern California which has bracteate spikes, long styles, and small ovate smooth nutlets with a simple or barely forked groove. Occasionally it grows with *C. hispidissima* and has been confused with that species, although it is readily separable from it by its bracteate spikes, shorter ovate nutlets, simple or barely forked groove, and commonly smaller corollas. The leaves are usually 1–3 mm. broad, but in some peculiar forms from Surf, Santa Barbara County, California, which apparently grew with the common form, the leaves are broadly oblong, retuse and nearly 10 mm. broad.

47. **C. hispidissima** Greene. Erect and ascendingly branched or loosely branched and somewhat decumbent, 1.5–5 dm. high; stems hirsute or somewhat appressed-hispid; leaves oblance-linear to linear-lanceolate, ascending, 1.5–5.5 cm. long, 1.5–4 mm. wide, obtuse or acute, appressed or frequently spreading-hispid, occasionally hirsute-ciliate; spikes ternate or geminate or rarely quadrinate, dense or remotely flowered, bractless or occasionally with 1–2 bracts near base, 1–8(–15) cm. long; corolla more or less conspicuous or occasionally inconspicuous, 1–5 mm. broad; fruiting calyx ovate-oblong, usually spreading, 2–5 mm. long, slightly asymmetrical, base broad, sessile; mature calyx-lobes lance-linear or almost lanceolate, connivent above with the tips somewhat spreading, margins strigose, midrib thickened and decidedly hirsute; nutlets 4, homomorphous, ovate-lanceolate,

1.5–2 mm. long, smooth or very finely granulate, usually shiny, back convex, sides obtusish, groove simple or forked at very base; gynobase elongata, ca. ⅔ height of nutlets; style reaching to nutlet-tips or definitely surpassing them.—Pittonia i. 118 (1887). *C. leiocarpa*, var. *hispidissima* Macbr. Contr. Gray Herb. n. s. xlviii. 43 (1916).

West of and in the Coast Ranges of California, from San Francisco to Point Conception and doubtfully to near Los Angeles.

California: San Francisco, 1888, *Greene* (G); grassy slopes, Lake Merced, 30 m. alt., *Tracy 1809* (G); Siersville, *Mann* (G); in sand, Gigling Station east of Del Monte, *Heller 6711* (G); Del Monte, *Elmer 3561* (G, UC); Cypress Point, Monterey, *Eastwood 86* (G); Seaside, Monterey, *Eastwood 161* (G); Monterey, 1900, *Eastwood* (G); sand hills beyond Castroville, *Heller 8493* (G); Point Pinos, *K. Brandegee* (UC); Pacific Grove, *Davy 7491* (UC); Gigling Station, 1908, *K. Brandegee* (UC); San Lucia Mts., *Summers 898* (UC); San Lucia Mts., *Summers 589* (UC); Hathaway Hill, 1888, Summers, (UC); Salinas River, 1885, *Curran* (G); Lemmon Ranch, Cholame, 1887, *Lemmon 4606* (G); Cholame, 1887, *Lemmon 4613* (G); Lemmon Ranch, 1887, *Lemmon 4559* (G); Casmaila Station, *K. Brandegee* (UC); Surf, 1909, *K. Brandegee d* (UC); Redondo, 1903, *Grant 5500* (UC).

Obviously related to *C. Clevelandi*, var. *florosa* and perhaps not to be kept specifically distinct, although differing in general range and length of style.

48. **C. microstachys** Greene. Erect slender herb 1–5 dm. high; stems commonly with numerous ascending simple or rebranched laterals, hirsute or rarely more or less strigose; leaves linear, obtuse or rounded, 1–6 mm. long, 1.5–5(–8) mm. broad, broadly sessile or the lower ones with a contracted base, hispid or hirsute, rarely somewhat strigose or pustulate; spikes slender, solitary or geminate, naked, 2–8 cm. long, frequently somewhat crowded towards the end of the stem and apparently paniculate; corolla inconspicuous, usually 0.4–1 mm. or rarely even 2.5 mm. broad; fruiting calyces ovate or oblong-ovate, 1.5–3 mm. but commonly 1.5–2 mm. long, sessile, strict or ascending, asymmetrical with the abaxial lobe the longest and most hirsute; mature calyx-lobes linear or linear-lanceolate, connivent above with the tips somewhat spreading, usually united below to form a short siliceous tube, midrib slightly thickened and divaricately short-hirsute, margins ciliate; ovules 4; nutlets 1 or rarely 2, next the abaxial calyx-lobe, acute-ovate to lanceolate, 1.5 mm. long, smooth and shiny, back and sides rounded, groove closed and simple or forked at very base; gynobase very short, ¼ or less height of nutlet; style about as long as gynobase and commonly attaining about ½ height of nutlet or when two nutlets develop reaching to beyond their middle.—Pittonia i. 116 (1887). *Krynitzkia microstachys* Greene in Gray, Proc. Am. Acad. xx. 269 (1885).

Coast Ranges of middle California and the coastal drainage of Southern California.

CALIFORNIA: gravelly slope east of Alder Springs, Glenn Co., *Heller 11444* (G); Colusa County, 1884, *Curran* (G); Wildcat Canyon, *Davy 7046* (UC); Mt. Diablo, 1886, *Greene* (UC); shelving gravelly slope, Mitchell Canyon, Mt. Diablo, *Baker 2810* (G); Salinas road near Del Monte, *Heller 6698* (G); Lewis Creek, 1893, *Eastwood* (UC); Estrella, *Jared* (UC); San Luis Obispo and Monterey counties, 1899, *Jared 2* (G); Santa Barbara, *Elmer 3797* (G); Painted Cave Ranch, *Eastwood 67a* (G, UC); Santa Inez Mts., 1888, *Brandegee* (UC); Fort Tejon, *Xantus 84* (G, TYPE); Tehachapi, 1889, *Brandegee* (G); at roadside, Topango Canyon, *Crawford & Hiatt 995* (G); Topango, 1898, *Barber* (UC); Eagle Rock Canyon, *Grant 241* (UC); Los Angeles, 1884, *Nevin 57b* and *57c* (G); Pasadena, *Grant 239* (UC); San Gabriel Canyon, *Eastwood 8956* (G); Evey Canyon, 900 m. alt., *Johnston 2019* (G); San Antonio Canyon, *Baker 3698* (G); hills near Claremont, *Baker 4779* and *4780* (G); Arrowhead Hot Springs, 480 m. alt., *Spencer 1305* (G); San Bernardino, *Parish 3645* (G, UC); desert slope of San Jacinto Mts., 1020 m. alt., *Jaeger 1873* (G); burn in chaparral, 8 km. northeast of Murietta, 450 m. alt., *Munz & Johnston 5346* (UC); Linda Vista, *Macbride & Payson 797a* (G); Potrero, *Orcutt 1277* (G); San Diego, 1882, *Pringle* (G); Mission Hills, San Diego, *Abrams 3415* (G).

This species is very closely related to *C. Clevelandi* from which it differs in its coarser habit, shorter style, and usually fewer nutlets. The forms most suggestive of that species come from Southern California and have more or less closely appressed pubescence and calyces becoming 2–3 mm. long. These forms are few, however, most specimens being conspicuously bristly and having calyces only 1.5–2 mm. long.

49. **C. nemaclada** Greene. Slender much-branched erect herb 1–3 dm. tall, minutely and sparsely strigose, finely hispid; leaves linear, rather few, 1–3 mm. long, 1–2 mm. broad, obtuse, somewhat appressed, finely hispid, very minutely pustulate; spikes solitary or geminate, slender, naked, becoming loosely flowered, 2–9 cm. long; corolla inconspicuous, less than 1 mm. broad; fruiting calyx oblong-ovate, strictly ascending, 2–4 mm. long, deciduous, obscurely biserial, subsessile by an obliquely conic base; mature calyx-lobes linear, connivent above with the slender tips spreading, midrib thickened and more or less abundantly hirsute but near the tip retrorsely setulose, margins sparsely strigose; ovules 4; nutlets 1–4, lanceolate to ovate-lanceolate, smooth, 1.7–2 mm. long, back convex, sides obtuse, the one next the abaxial calyx-lobe always developing, groove opened or closed but usually open at the broad forking; gynobase slender, about ½ the length of the nutlets; style reaching to about ¾ the height of the nutlets.—Pittonia i. 118 (1887).

Coast Ranges of California from Tehachapi to Colusa County; rare.

CALIFORNIA: Keene Station, Tehachapi, 1905, *K. Brandegee* (UC); Paso Robles, *K. Brandegee* (UC); Alcalde, 1892, *Brandegee* (UC); Colusa County, 1884, *Curran* (UC, part of TYPE).

The plant is obviously related to *C. Clevelandi* and *C. hispidissima*, and further study may justify the reduction of it to one of the species named. Its outstanding feature is the possession of small stout retrorse hairs on the upper part of the calyx-lobes. The type came from Colusa County in the North Coast Range.

50. **C. Clevelandi** Greene. Usually erect freely branched herb 1–5 dm. tall; stems with long branches, strigose or hirsute; leaves linear to linear-lanceolate, usually acutish, 1–4(–6) cm. long, 1–4 mm broad, hirsute or occasionally strigose, spreading; spikes solitary or geminate or ternate, 4–10 cm. long, naked, slender, usually remotely flowered; corolla inconspicuous or conspicuous, 1–5 mm. broad; fruiting calyces ovate-oblong or nearly ovate, 2–5 mm. long, strict, asymmetrical, deciduous, subsessile by an obliquely conical base; mature calyx-lobes linear or lance-linear, usually decidedly connivent with tips somewhat spreading, midrib thickened and decidedly hirsute, margins densely hispid-ciliate; nutlets 1–4, ovate-oblong to broadly lanceolate, 1.5–2(–2.5) mm. long, smooth, usually very finely granulate, back convex, sides obtuse or rounded, axial nutlet always developing; groove closed, broadly forked at base or rarely with a small areola; gynobase elongate, ½–⅔ as high as the nutlets; style reaching to ⅔–$^4/_5$ height of nutlets.—Pittonia i. 117 (1887).

Var. **genuina**. Corolla inconspicuous, ca. 1 mm. broad; leaves 1–2(–3) mm. broad; spikes solitary or geminate, not sharply differentiated from leafy mass of plant; nutlets 1–2.—*C. Clevelandi* Greene, l. c.

West of the mountains from the vicinity of Los Angeles southward to northern Lower California.

CALIFORNIA: shaded hillsides, San Jose Hills west of Pomona, 300 m. alt., *Munz & Harwood 3299* (UC); Chollas, 1884, *Orcutt* (UC); San Diego, 1898, *Purpus* (UC); San Diego, 1884, *Brandegee* (UC); San Diego, 1906, *K. Brandegee* (UC); San Diego, 1885, *Greene* (UC, ISOTYPE); Point Loma, 1895, *Brandegee* (UC); Point Loma, 1906, *K. Brandegee* (UC). LOWER CALIFORNIA: Todos Santos Island, 1897, *Brandegee* (UC); All Saints Bay, 1885, *Greene* (UC); Cariso Creek, 1893, *Brandegee* (UC); Vallederos, 1893, *Brandegee* (UC).

Var. **florosa**, var. nov., a varietate genuina differt corolla conspicua 2–5 mm. lata, foliis 1–4 mm. latis, spicis saepe ternatis et supra folia projectis, nuculis 1–4.—*C. Rattani* Greene, Pittonia i. 160 (1887).

In and west of the Coast Ranges of California from San Luis Obispo to San Diego, and infrequent northward to Lake County.

CALIFORNIA: ridges west of Leesville, Lake Co., *Heller 13124* (G); rocky slopes, Knoxville, *Baker 2966* (G); above San Antonio, *without collector* (UC); foot of Jolon Grade, *K. Brandegee* (UC); San Lucia Mts., *Summers* (UC); San Lucia Mts., *Summers 598* and *899* (UC); Reservoir, Hathaway Hill, 1884, *Summers* (UC); San Luis Obispo, 1905, *Roadhouse 54* (UC); San Luis Obispo, 1911, *Condit* (UC); Chorro Station near San Luis Obispo, *K. Brandegee* (UC); steep hills near Lompoc, *Suksdorf 220* and *7757* (G); Gaviota, *K. Brandegee* (UC); near Frazier Borax Mine, Mt. Pinos, *Abrams & McGregor 211* (G); Sisquoc, *Baker 22* (UC); Tehachapi, *K. Brandegee* (UC); Painted Cave Ranch, *Eastwood 31* (UC); San Miguel Island, 1886, *Greene* (UC); Santa Cruz Island, 1908, *Niedenmuller* (UC); Santa Cruz Island, 1888, *Brandegee* (UC); Santa Barbara, *Elmer 3936* (G); Santa Barbara, *Brewer 278* (UC); Santa Inez Mts., 1888, *Brandegee* (UC); Saugus, 1901, *Davy* (UC); South Beach, 1898, *Barber* (UC); Santa Monica Canyon, *Barber 116* (UC); Playa del Rey, *Hall 3780* (G, UC); San Pedro, 1889, *K. Brandegee* (UC); Santa Catalina Island, 1889, *Brandegee* (UC); grassy hillsides, Turnbull Canyon, Puente Hills, *Johnston 1935* (G); shaded hillside, Laguna, *Munz 2214* (G); roadside, Linda Vista, *Macbride & Payson 797* (G, TYPE); San Diego, 1906, *K. Brandegee* (UC).

This species includes almost all the material from South California passing as *C. leiocarpa*. It is related on one hand to *C. hispidissima* and on the other to *C. microstachys*, apparently intergrading with both. In having a very short style, elongate nutlets and bractless spikes, it differs from *C. leiocarpa*. Doubtfully included in the species are several collections from the North Coast Ranges.

51. **C. Brandegei** Johnston. Much branched decumbent or prostrate herb; stems numerous, slender, hispid-strigose, 1–4 dm. long; leaves oblong-lanceolate or lanceolate, spreading, 5–15 mm. long, 2–3(–4) mm. broad, obtuse or acute, hispid-strigose and often sparsely hispid, minutely pustulate; spikes solitary or occasionally geminate, 2–8 cm. long, dense or loose and elongate, slender, more or less evidently leafy-bracted; corolla inconspicuous, less than 1 mm. broad; fruiting calyx ovate-oblong, 2–4 mm. long, strictly ascending, asymmetrical, becoming obscurely biserial, sessile; mature calyx-lobes lance-linear, usually connivent above with the tips spreading, midrib thickened and hirsute, margins strigose; nutlets 1–4, ovate-lanceolate, 1.5–2 mm. long, smooth or very minutely granulate, usually shiny, back convex, sides rounded, face flattened, groove closed with a well developed basal fork; gynobase subulate, about $\frac{1}{2}$–$\frac{2}{3}$ height of nutlets; style reaching to $^{2}/_{3}$–$^{4}/_{5}$ height of nutlets.—Contr. Gray Herb. n. s. lxviii. 53 (1923)

Known only from Santa Rosa off the coast of California.

CALIFORNIA: Santa Rosa Island, 1888, *Brandegee* (G, TYPE; UC, ISOTYPE).

In habit much suggesting *C. leiocarpa* but differing in its more elongate nutlets, widely forked groove, short style and more southern insular range. It is much more closely related to, and perhaps it is

only a phase of, *C. Clevelandi* with which it agrees in nutlets although differing in its longer style and bracteate inflorescence. *Cryptantha Clevelandi*, var. *florosa* occurs on Santa Cruz and San Miguel islands which are adjacent to Santa Rosa Island.

52. **C. Abramsii** Johnston. Erectly and sparsely branched herb 1–3 dm. high; stem slender, finely strigose; leaves linear, rather numerous, 1–3 cm. long, 1–1.5 mm. broad, acutish, hispid-strigose, usually sparsely hirsute-ciliate towards the base; spikes solitary or rarely geminate, 2–10 cm. long, evidently leafy-bracted; corolla evident, 1.5–2.5 mm. broad; fruiting calyx ovate, strict, 2.5–4 mm. long, asymmetrical, becoming distant and obscurely biserial, sessile by an oblique broadly conic base; mature calyx-lobes lance-linear, loosely connivent, midrib somewhat thickened and on abaxial lobe sparsely and very shortly hirsute, margins strigose; nutlets 1–4, lanceolate, acuminate, ca. 2 mm. long, smooth, shiny, back convex, sides obscurely obtuse, groove closed and broadly forked at very base of nutlet; gynobase narrow, about ⅔ height of nutlets; style reaching to $^3/_4$–$^4/_5$ height of nutlets.—Contr. Gray Herb. n. s. lxviii. 52 (1923).

Southern California, known only from the type locality.

California: San Pedro Hills near Malaga Cove, *Abrams 3139* (G, type; UC, isotype).

Although suggesting *C. leiocarpa* in its bracteate inflorescence, this species differs in its shorter style and elongate nutlets with a broad decidedly basal forking of the groove. It is most related to *C. Clevelandi*, var. *florosa* and possibly is only a bracteate phase of it.

Ser. XIV. FLACCIDAE. Nutlet 1, smooth, somewhat ovate, laterally rounded or obscurely angled, always abaxial; style reaching to ¼–⅔ height of nutlet; calyx-lobes armed with pallid encrusted arcuate or uncinate hairs.

Style reaching to 1/2–2/3 height of nutlet; nutlet with an open areola; rather coarse plants. . . . . 53. *C. rostellata.*
Style reaching to less than 1/2 height of nutlet; nutlet with a closed groove; more slender plants.
Nutlets nearly terete, rostrate; hairs on calyx usually decidedly encrusted and pale. . . . . 54. *C. flaccida.*
Nutlets evidently compressed, acute; hairs on calyx rather smooth and less pale. . . . . 55. *C. sparsiflora.*

53. **C. rostellata** Greene. Stems stiffish, usually somewhat reddish, 1–2 dm. high, with few ascending branches above, strigose, canescent; leaves few, notably persistent and opposite, thickish, firm, oblanceolate, 10–15 mm. long, 2–3 mm. broad, ascending; spikes

solitary or geminate, stiffish, naked, 2–4 cm. long; corolla inconspicuous, 0.5–1 mm. broad; fruiting calyces 3–4 mm. long, oblong-ovate, spreading or ascending (not strict), coarse, rather few, subpersistent, subsessile by a very asymmetrical base; mature calyx-lobes lanceolate, margin sparsely ciliate or strigose, midrib on all lobes armed with stout encrusted uncinate or arcuate hairs; ovules 4, the one next the abaxial calyx-lobe alone developing; nutlets 1, smooth, compressed, ovate-lanceolate to lanceolate, 2–3 mm. long, back convex, sides rounded, base truncate; groove closed above but dilated below into a definite areola; gynobase very short and stout; style reaching up to ⅓–½ height of nutlet.—Pittonia i. 116 (1887). *Krynitzkia rostellata* Greene, Bull. Calif. Acad. Sci. i. 203 (1885). *K. Suksdorfii* Greenm. Bot. Gaz. xl. 146 (1905). *C. Suksdorfii* Piper, Contr. U. S. Nat. Herb. xi. 484 (1906).

Southern Washington (Klickitat County) southward through eastern Oregon to the Sacramento Valley of California.

WASHINGTON: on dry hills near Rockland, *Suksdorf 1495* (G, TYPE of *K. Suksdorfii;* UC, ISOTYPE). OREGON: on dry hills near Dalles City, *Suksdorf 2346* (G, UC); camp by Grizzly Butte, Crook Co., 1170 m. alt., *Leiberg 282* (G, UC). CALIFORNIA: Hornbrook, 1889, *Howell* (UC); Hornbrook, *Howell 1386* (UC); Leesburg, 1884, *Curran* (UC, "part of type"); near Chico, 1887, *Parry* (UC); Lake County, 1884, *Curran* (G).

Obviously related to *C. flaccida* but readily separated by its usually coarse habit, longer style, compressed nutlets and basally dilated groove. The type is given as having been collected in "Lake County," California. Specimens in the University of California Herbarium, given as from "Leesburg," a town in Colusa County, California, are labeled as "part of type." This material, to judge from general appearance, seems quite the same as the authentic specimen of *C. rostellata* contained in the Gray Herbarium and probably is part of the same collection.

54. **C. flaccida** (Dougl.) Greene. Subsimple or ascendingly branched pallid strigose herb 1.5–4.5 dm. high; stems sparsely close-strigose with short pallid encrusted hairs; leaves oblance-linear or linear or even filiform, 2–6 cm. long, 1–2(–3) mm. wide, closely strigose, strict or ascending, firm, basal portion of lower leaves somewhat persistent; spikes quinate to solitary, naked, usually stiffish, 4–8(–16) cm. long; corolla inconspicuous or medium sized, 1–4 mm. broad; fruiting calyces oblong-ovate, 2–4(–5) mm. long, evidently asymmetrical, usually strict and closely hugging the stem, commonly firm and stiff, sessile or subsessile, base broadly conic; mature calyx-lobes lance-linear, closely connivent above with the tips commonly spread-

ing, margins more or less ciliate or strigose, midrib thickened and armed with pale spreading coarse encrusted arcuate or uncinate bristles, abaxial lobe longest and most hirsute; ovules 4 but only the one next the abaxial calyx-lobe developing; nutlet 1, lance-ovate, rostrate-acuminate, subterete or only slightly compressed, smooth or very finely granulate; groove closed and frequently with the margins overlapping, rarely open particularly towards the base where dilated to form a small areola; gynobase low and stout, scarcely developed, 0.6–0.2 mm. tall; style $\frac{1}{3}$–$\frac{1}{2}$ as high as nutlet.—Pittonia i. 116 (1887). *Myosotis flaccida* Dougl. in Lehm. Pugil. ii. 22 (1830). *Eritrichium oxycaryum* Gray, Proc. Am. Acad. x. 58 (1874). *Krynitzkia oxycarya* Gray, Proc. Am. Acad. xx. 269 (1885). *C. multicaule* Howell, Fl. N. W. Amer. i. 487 (1901); not Nels. (1900). *C. Howellii* Nels. Bot. Gaz. xxxiv. 30 (1902).

Washington and Idaho to Southern California.

WASHINGTON: Coulee City, *Piper 3887* (G); junction of Crab and Wilson creeks, 450 m. alt., *Sandberg & Leiberg 304* (G, UC); near Sprague, 540 m. alt., *Sandberg & Leiberg* 173 (G, UC); Almota, *Piper 1702* (G); Walla Walla, 1883, *Brandegee* (UC); Waitsburg, *Horner 1170* (G). OREGON: along Des Chutes River at Sherar's Bridge, *Howell 502* (G. ISOTYPE and photograph of TYPE of *C. multicaulis*); Rhea Creek, 390 m. alt., *Leiberg 54* (G, UC); camp at Grizzly Butte, 1170 m. alt., *Leiberg 283* (G, UC); crevices of rocks, Tone, 1903, *Lunell 16* (G); bank of Hood River, 1883, *Henderson* (G); railroad track, Tonquin, *Nelson 3096* (G); dry stubble-field pastured to sheep, 1.6 km. north of Salem, *Nelson 4893* (G); dry bank, 1.6 km. north of Salem, *Nelson 2222* (G); dry slope near Illahe, *Nelson 1377* (G). IDAHO: valley of Clearwater River, *Sandberg, MacDougal & Heller 163* (G); about Lewiston, *Heller 3068* (UC); sandy flats, Falk's Store, 660 m. alt., *Macbride 36* (G); loamy sagebrush flat, Regena, 750 m. alt., *Macbride & Payson 2842* (G); Boise, 1881, *Canby* (G); without locality, 1892, *Mulford* (G). CALIFORNIA: dry land near Yreka, *Butler 734* and *1298* (UC); Yreka, *Smith 211* (G); Ager, 1887, *K. Brandegee* (UC); Edgewood, 1887, *Brandegee* (UC); Hy-Am-Pum, 1888, *Chestnut & Drew* (UC); Iqua, 1882, *Rattan 19* (G); Hupa Indian Reservation, 150 m. alt., *Chandler 1304* (G); dry hillside at little Van Duzen Bridge, 750 m. alt., *Tracy 2758* (UC); dry hillside at Alder Point Bridge on Eel River, 150 m. alt., *Tracy 1880* (UC); along ridge above Hopland, *Baker 3003* (G); Potter Valley, 1898, *Purpus* (UC); sunny hillsides, Potter Valley, *Purpus 1294* (UC); near Madison, *Heller & Brown 5410* (G); Russian River bed at Cloverdale, *Bolander 6541* (G, UC); between Cloverdale and Ukiah, *Bolander 3896* (UC); Leesville, 1889, *Brandegee* (UC); Cloverdale, 1890, *K. Brandegee* (UC); Howell Mt., 360 m. alt., *Tracy 439* (UC); Colusa County, 1884, *Curran* (G); Tiburon, *Eastwood 306* (G); Lower Pleasant Valley, *1891, Jepson* (UC); Sacramento Valley, *Hartweg 1872* (G); near mouth of Little Grizzly Creek below Genessee, *Heller & Kennedy 8853* (G); stony bank, 13 km. north of Oroville, *Heller 11325* (G, UC); Little Chico Canyon, 1896, *Austin 624* (UC); Little Chico, 1883, *Austin* (UC); Kelsey, 1889, *Brandegee* (UC); Sweetwater Creek, 1907, *K. Brandegee* (UC); The Buttes, 1891, *Jepson* (UC); Jackson, 390 m. alt., *Hansen 152* (G, UC); Pine Grove, 750 m. alt., *Hansen 430* (G); York Falls, 600 m. alt., *Hansen 431* (G, UC); Knight's Ferry, 1854, *Bigelow* (G); Mokelumne Hill, *Blaisdell* (G); Harmon Peak, *Davy 1420* (UC); Agua

Fria, 1897, *Congdon 44* (G); Beckwell Adobe, 1897, *Congdon 45* (G, UC); Yosemite Valley, *Bolander 6386* (G, UC); Yosemite, 1875, *McLean* (UC); Yosemite Valley, 1200–1350 m. alt., *Abrams 4560* (G); Wawona, *Lemmon* (UC); Borax Lake, *Torrey 329* and *333* (G); Madera, *Buckminster* (UC); Tehipite Valley, 1200 m. alt., *Hall & Chandler 505* (UC); Toll House, Fresno County, 1215 m. alt., *Hall & Chandler 32* (UC); Dunlap, 1893, *Eastwood* (UC); hillsides, North Tule River, *Purpus 5692* (UC); near Old Colony Mill, Giant Forest, 1905, *K. Brandegee* (UC); Portersville, *Donnelly 25* (UC); Camp Badger, 1892, *Holway 6* (UC); sunny gravelly slopes, Bear Creek, *Purpus 1707*; grassy fields, Caliente, *Heller 7625* (G); Caliente, 1892, *Brandegee* (UC); Tehachapi, 1889, *Brandegee* (UC); Keane, 510 m. alt., *Jones* (UC); north of Mt. Diablo, *Brewer 1129* (G); along banks and roadsides, Crystal Springs Lake, *Baker 468* (G, UC); Mt. Hamilton, *Elmer 5038* (UC); between Brick Yard and Licks Observatory, 1110 m. alt., *Pendleton 907* (UC); along Mt. Hamilton road, 22.5 km. from San Jose, *Heller 7437* (G, UC); Coyote, *Chandler 957* (UC); Lewis Creek, 1893, *Eastwood* (UC); Jolon, *Brandegee* (UC); without locality, 1899, *Jarea 1* (G); Lancaster, *K. Brandegee* (UC); Saugus, 1889, *Brandegee* (UC); Los Angeles, 1884, [*Nevin?*] *57g* (G); grassy mesa, Red Hill, 330 m. alt., *Johnston 1941* (G); dry ridges near Cuyamaca Lake, *Abrams 3824* (G); Colorado Desert, 1905, *Brandegee* (UC); without locality, *Blake* (G).

One of the best known species in the genus, readily recognized by its pallid strigose pubescence, stout arcuate bristles on the calyx-lobes, very short style and solitary terete ovate and rostrate nutlet. The type was collected by Douglas probably in eastern Oregon or Washington.

55. **C. sparsiflora** Greene. Very slender, sparingly and ascendingly branched sparsely strigose herb 1–3 dm. tall; cotyledons somewhat persistent, ovate to orbicular, 2.5 mm. broad, contracted to a petiole 2 mm. long; leaves few, narrowly linear, 1–3 cm. long, ca. 1 mm. broad, strigose, herbaceous, noticeably opposite below; spikes geminate or solitary, 2–6 cm. long, slender, not stiff, with 1–2 bracts near very base; corolla inconspicuous, less than 1 mm. broad; fruiting calyces 2–3 mm. long, ovate or oblong-ovate, ascending, few, early deciduous, subsessile by a very asymmetrical broadly conic base; mature calyx-lobes linear-lanceolate, united for ½–¼ length of calyx, loosely connivent, margins sparsely ciliate, midrib slightly thickened, armed with short stout smoothish uncinate hairs; ovules 4, the one next the abaxial calyx-lobe alone developing; nutlet 1, ovate, acute (scarcely if at all acuminate), decidedly compressed, smooth or finely granulate, 2 mm. long, equalled or somewhat surpassed by calyx-lobes, base somewhat truncate, back convex, margins angled, groove closed and broadly forking near the base; gynobase low; style attaining ⅓–½ height of nutlet.—Pittonia i. 116 (1887). *Krynitzkia sparsiflora* Greene, Bull. Calif. Acad. Sci. i. 203 (1885).

Slopes surrounding the Sacramento and San Joaquin valleys of California.

California: Lake County, 1884, *Curran* (G, UC); Coburn Mills, 1892, *Brandegee* (UC); Mormon Bar, Mariposa Co., 1889, *Congdon* (G); Whitlocks, 1897, *Congdon* (G); Havilah, 1891, *Brandegee* (UC).

Although having broad nutlets suggestive of *C Torreyana*, this species is clearly related to *C. flaccida* as shown by its somewhat encrusted strigose pubescence, single abaxial nutlet, and falcate or uncinate bristles on the calyx-lobe. The plant is characterized by its broad nutlets, very slender habit, and short uncinate bristles on the calyx. The type of the species was collected by Curran somewhere in northern California, probably in Lake or Colusa counties.

Ser. XV. AFFINES. Nutlets 1 or 4, smooth, ovate, laterally rounded, asymmetrical with an excentric groove and an irregular areola, when single always abaxial; style reaching ¼–⅔ height of nutlets.

Nutlets 4; style reaching at least to 2/3 height of nutlets; flowers in biseriate spikes; plant erect.....56. *C. affinis.*
Nutlet solitary; style not reaching to middle of nutlet; flowers axillary; plant spreading.....57. *C. glomeriflora.*

56. **C. affinis** (Gray) Greene. Usually sparsely branched herb 1–2(–4) dm. high; branches commonly few and ascending but plant occasionally much branched from the base, hispid or short-hirsute throughout; leaves narrowly to broadly oblanceolate, 1–4(–5) cm. long, 2.5–6(–8) mm. broad, few, short-hirsute, usually minutely pustulate, obtuse or rounded at tip, lowest pair clearly opposite; spikes geminate or solitary, usually 2–8 but becoming 15 mm. long, slender, remotely flowered, commonly with a very few large leafy bracts below; corolla inconspicuous, 1–2 mm. long, limb ca. 1.5 mm. broad; fruiting calyx 2.5–4 mm. long, usually about as broad as long, laterally compressed, ascending; pedicels 0.5–1 mm. long; mature calyx-lobes lanceolate, somewhat connivent, not greatly surpassing the nutlets, midrib weakly thickened and on the abaxial lobe sparsely hirsute, margins appressed-hispid; nutlets 4, homomorphous, smooth or very finely granulate, shiny, brownish to greenish, frequently mottled, 1.8–2.5 mm. long, ovate, obliquely compressed, back low-convex, margins rounded; groove evidently excentric, closed, simple or shortly and unequally forked at the base; gynobase short, stout, ca. $\frac{1}{2}$ height of nutlets; style evidently surpassed by nutlets or rarely equalling them.—Pittonia i. 119 (1887); Macbr. Contr. Gray Herb. n. s. xlviii. 46 (1916). *Krynitzkia affinis* Gray, Proc. Am. Acad. xx. 270 (1885). *C. geminata* Greene, l. c. *C. confusa* Rydb. Bull. Torr. Bot. Cl. xxxvi. 679 (1909).

Washington and western Montana to Southern California, northern Nevada and southern Wyoming.

WASHINGTON: Falcon Valley, *Suksdorf 455* (G); open pine wood, Falcon Valley, *Suksdorf 179* and *3207* (UC); valley of Swauk River, *Sharples 195* and *197* (G); Kamiach Butte, *Piper 3092* (G); dry rocky hillsides, Blue Mts., 1897, *Horner* (G); dry low ground northwest of Chenowith, *Suksdorf 2768* (UC); east side of Cascades, 1860, *Lyall* (G, TYPE of *K. affinis*). OREGON: dry slopes along Ashland-Klamath Falls road, 19 km. west of Keno, *Peck 9313* (G); without locality, *Howell 371* (G). IDAHO: Beaver Canyon, *Watson 286* (G); Payette Lake, 1899, *Jones* (UC). MONTANA: Priests, 1894, *Brandegee 98* (UC). WYOMING: Upper Madison Canyon, Yellowstone Park, 2200 m. alt., *Rydberg & Bessey 4884* (G, ISOTYPE of *C. confusa*). UTAH: City Creek Canyon near Salt Lake City, *Jones 269* (G) and *107* (UC). NEVADA: log railroad north of Verdi, 1590 m. alt., *Heller 10873* in pt. (G). CALIFORNIA: near Shasta Springs, *Heller 7962* (G); moist open places near Durney's Mill, north base of Mt. Eddy, *Heller 13287* (G, UC); Metcalf's Ranch, northeast base of Mt. Eddy, 1170 m. alt., *Heller 12397* (G); Goose Valley, *Eastwood 737* (G); Susanville, 1891, *Brandegee* (UC); meadows 3 km. south of Red Clover Valley, *Heller & Kennedy 8729* (G); Prattville, 1892, *Brandegee* (UC); Prattville, *Heller & Kennedy 8777* (G); edge of forest about Chico Meadows, 1200 m. alt., *Heller 11489* (G, UC); Sutton House, Butte Co., *Curran* (UC); in gravel on edge of north slope, Little Summit, *Heller 11487* (G, UC); moist soil along lake shore with aspen, Donner Lake, *Hall 6946* (G); near Donner Lake, *Torrey 331* (G); Strong's Canyon near Truckee, 1884, *Curran* (G); Old Camp on Truckee, *Sonne* (UC); Truckee, 1885, *Curran* (UC); lower end of Donner Lake, *Heller 6946* (G); Cobb Mt., Lake Co., *C. F. L.* (UC); near summit of Mt. Sanhedrin, Lake Co., *Heller 5882* (G); near Cape Horn, *K. Brandegee* (UC); Cathedral Trail to Mt. Tallac, 2100 m. alt., *Smiley 219* (G); Sly Park in sierran foothills of El Dorado Co., 1020 m. alt., *Hall 11276* (G, UC); Lake Valley, 1908, *K. Brandegee* (UC); Silver Lake, 1882, *Hansen* (UC); Bear Valley, Calaveras Co., 1800 m. alt., *Hansen 516* (G, UC); Yosemite Valley, *Abrams 4379* (G); Indian Creek, Yosemite Park, 2190 m. alt., *Hall 9172* (G); Vernal Falls, Yosemite Park, *Hall 8925* (UC); summit of Mt. Surprise, 1890, *Congdon 326* (UC); North Fork of San Joaquin, Madera Co., 1895, *Congdon* (G, UC); South Fork of San Joaquin River, Lost Valley, 2280 m. alt., *Hall & Chandler 650a* in pt. (UC); Hockett Meadows, 2550 m. alt., *Hall & Babcock 5632* (UC); Ellis Meadows, 1914, *K. Brandegee* (G); Sequoia National Forest, *Davidson 1820* (G); Sequoia Mills, 1892, *Eastwood* (UC); General Grant Big Tree Grove, 1892, *Brandegee* (UC); Natural Bridge of Volcano Creek, 2250 m. alt., *Hall & Babcock 5439* (G); dryish edge of meadow, Mare Flats, San Bernardino Mts., 2400 m. alt., *Crawford 934* in pt. (G); Middle Peak, Cuyamaca Mts., *Abrams 3856* (G); Southern California, 1888, *Palmer 183* (G).

Especially characteristic of this plant are its obliquely compressed nutlets and the resulting excentric position of the groove. The nutlets appear to be compressed by a force perpendicular to the axial and abaxial faces of the stout gynobase. Greene, l. c., has remarked on this development as exemplified in the type of the synonymous *C. geminata*.

57. **C. glomeriflora** Greene. Small very slender herb 1–8(–10) cm. high; stems simple or with more or less numerous ascending re-

branched basal branches, finely and very appressedly short-hispid or rarely somewhat spreadingly hispid; leaves linear-oblong to oblanceolate or lanceolate, 5–10 mm. long, 0.8–1.3 mm. broad, appressed short-hispid, minutely pustulate; flowers axillary, frequently borne along short branchlets and glomerate, distributed over nearly all parts of the plant; corolla inconspicuous, tubular and just surpassing the calyx, 1.3–1.8 mm. long, ca. 1 mm. broad, lobes broadly orbicular and erect, appendages trapeziform; fruiting calyx obovate, 2–2.5 mm. long, ascending, asymmetrical, united for ⅓–½ its length, base conical and somewhat siliceous, sessile, deciduous, not at all biserial; mature calyx-lobes lanceolate, erect or slightly connivent, midrib thickened and hirsute especially on abaxial lobe, margin short-hispid or hispid-strigose; ovules 4; nutlet 1, ovate, acute, 1.5–2 mm. long, next the abaxial calyx-lobe, asymmetrical, persistent, smooth and shiny, usually greenish, just surpassing or about equalling the axial calyx-lobes, back and sides rounded, face somewhat flattened; groove slightly off-center, closed except just above very base of nutlet where opening abruptly into an irregular roughened areola; gynobase very reduced, ca. 1/10 height of nutlet; style very short, not much surpassing the aborted nutlets, surpassed by the mature nutlet by over 1 mm. —Pittonia i. 116 (1887).

Central Sierra Nevada of California. Rare.

California: borders of ice-ponds below Truckee, 1887, *Sonne* (UC, isotype); dry gravelly pine forest, Tuolumne Meadows, 2600 m. alt., *Ware 2690c* (G); Volcano Creek, Upper Kern River, 2400 m. alt., *Hall & Babcock 5322* (UC).

A very rare and distinct species with a habit recalling *Plagiobothrys* § *Allocarya*. It is very well marked in having asymmetrical solitary nutlets that about equal the calyx-lobes, and in having decidedly axillary glomerate flowers with no suggestion of a biserial arrangement. The nutlets are suprabasal in attachment.

Excluded or Unidentified Species.

Cryptantha Bartolomaei Greene, Pittonia ii. 232 (1892). "Aspect, pubescence and inflorescence of *C. utahensis*, but the minute (½ line long) ovate-lanceolate nutlets (4 and consimilar) perfectly smooth and lucid, and without margin; the ventral groove shortly bifurcate at base, but closed throughout. Bay of San Bartolomé, Lower California, Lieut. Pond, 1889. A connecting link between the *oxygona* and *leiocarpa* groups in the genus."—The identity of this species is wholly obscure.

CRYPTANTHA FALLAX Greene, Pittonia v. 54 (1902). "With much the aspect of a slender *C. muriculata*, less than a foot high, the branches with scattered oblong-linear obtuse foliage and terminating in 3 divergent short and rather dense spikes; stem sparsely villous-hirsute, the foliage as sparingly somewhat strigose, the calyxes with a dense pubescence under the rather few very hispid spreading hairs: calyx-segments lanceolate, short, the tips not attenuate; corolla minute; nutlets ovate-lanceolate from a truncate base, traversed ventrally by a closed scar, this shortly forked at base, the whole surface grayish, smooth and shining, the back but slightly convex and distinctly sharp-edged. A very remarkable species in the almost wing-margined character of the smooth nutlets; for the plant has the aspect of that group of species whose nutlets are obtuse all around, and muricate. The only specimen known was collected by myself in the mountains above Tehachapi, California, 22 June, 1889, and was mixed with my duplicates of *C. muriculata* until now."—Perhaps conspecific with *C. mohavensis*.

Cryptantha heliotropoides Loes. in Fedde, Repert. xii. 243 (1913) = ANTIPHYTUM HELIOTROPIOIDES A. DC. Prodr. x. 122 (1846).

Cryptantha Torreyi Rydb. Mem. N. Y. Bot. Gard. i. 331 (1900).—Although taken up in place of *C. Torreyana* (Gray) Greene, this name is based on *Eritrichium Torreyi* Gray and so falls into the synonymy of PLAGIOBOTHRYS TORREYI Gray, Proc. Am. Acad. xx. 284 (1885).

Krynitzkia californica Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS TRACHYCARPUS (Gray) Johnston, Contr. Gray Herb. n. s. lxviii. 78 (1923).

Krynitzkia californica, var. *subglochidiata* Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS SCOPULORUM (Greene) Johnston, Contr. Gray Herb. n. s. lxviii. 79 (1923).

Krynitzkia Chorisiana Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS CHORISIANUS (Cham.) Johnston, Contr. Gray Herb. n. s. lxviii. 77 (1923).

Krynitzkia Cooperi Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS PARISHII Johnston, Contr. Gray Herb. n. s. lxviii. 78 (1923).

Krynitzkia depressa Jones, Contr. W. Bot. xiii. 5 (1910) = OREOCARYA DEPRESSA (Jones) Macbr. Contr. Gray Herb. n. s. xlviii. 32 (1916).

Krynitzkia echinoides Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895) = OREOCARYA ECHINOIDES (Jones) Macbr., i. e. plant treated by Macbride, Contr. Gray Herb. n. s. xlviii. 36 (1916), as *O. fulvocanescens*.

Krynitzkia floribunda Gray, Proc. Am. Acad. xx. 265 (1885) = ANTIPHYTUM FLORIBUNDUM (Torr.) Gray, Proc. Am. Acad. x. 55 (1875).

Krynitzkia fulvocanescens Gray, Proc. Am. Acad. xx. 280 (1885) = OREOCARYA FULVOCANESCENS (Gray) Greene, i. e. *O. echinoides* of Macbride, Contr. Gray Herb. n. s. xlviii. 31 (1916)

Krynitzkia fulvocanescens, var. *idahoensis* Jones, Contr. W. Bot. xiii. 6 (1910) = OREOCARYA sp.

Krynitzkia glomerata Gray, Proc. Am. Acad. xx. 279 (1885) = OREOCARYA GLOMERATA (Pursh) Greene, Pittonia i. 58 (1887).

Krynitzkia glomerata, var. *acuta* Jones, Zoe ii. 250 (1891) = OREOCARYA WETHERILLII Eastw. Bull. Torr. Bot. Cl. xxx. 242 (1903).

Krynitzkia glomerata, var. *virginensis* Jones, Contr. W. Bot. xiii. 5 (1910) = OREOCARYA VIRGINENSIS (Jones) Macbr. Proc. Am. Acad. li. 547 (1916).

Krynitzkia heliotropioides Gray, Proc. Am. Acad. xx. 265 (1885) = ANTIPHYTUM HELIOTROPIOIDES A. DC. Prodr. x. 122 (1846).

Krynitzkia Jamesii Gray, Proc. Am. Acad. xx. 278 (1885) = OREOCARYA SUFFRUTICOSA (Torr.) Greene, Pittonia i. 57 (1887).

Krynitzkia Kingii Wats. acc. Hillman, Nevada Agric. Exper. Sta., Bull. xxiv. 71 (1895) = PLAGIOBOTHRYS KINGII (Wats.) Grav, Proc. Am. Acad. xx. 281 (1885).

Krynitzkia leucophaea Gray, Proc. Am. Acad. xx. 280 (1885) = OREOCARYA LEUCOPHAEA (Dougl.) Greene, Pittonia i. 58 (1887).

Krynitzkia leucophaea, var. *alata* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 710 (1895) = OREOCARYA CONFERTIFLORA Greene, Pittonia iii. 112 (1896).

Krynitzkia lithocarya Greene in Gray, Proc. Am. Acad. xx. 265 (1885) = PLAGIOBOTHRYS LITHOCARYUS (Greene) Johnston, Contr. Gray Herb. n. s. lxviii. 76 (1923).

Krynitzkia mensana Jones, Contr. W. Bot. xiii. 4 (1910) = OREOCARYA EULOPHUS Rydb. Bull. Torr. Bot. Cl. xxxi. 637 (1905).

Krynitzkia mollis Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS MOLLIS (Gray) Johnston, Contr. Gray Herb. n. s. lxviii. 74 (1923).

Krynitzkia multicaulis, var. *abortiva* Jones, Contr. W. Bot. xiii. 5 (1910) = OREOCARYA SUFFRUTICOSA, var. ABORTIVA (Jones) Macbr. Proc. Am. Acad. li. 547 (1916).

Krynitzkia multicaulis, var. *setosa* Jones, Contr. W. Bot. xiii. 4 (1910) = OREOCARYA sp.

Krynitzkia oblata Jones, Contr. W. Bot. xiii. 4 (1910) = OREOCARYA OBLATA (Jones) Macbr. Proc. Am. Acad. li. 548 (1916).

Krynitzkia Palmeri Gray, Proc. Am. Acad. xx. 278 (1885) = OREOCARYA PALMERI (Gray) Greene, Pittonia i. 57 (1887).

Krynitzkia Parryi Gray, Proc. Am. Acad. xx. 265 (1885) = ANTIPHYTUM PARRYI Wats. Proc. Am. Acad. xviii. 122 (1883).

Krynitzkia peninsularis Rose, Contr. U. S. Nat. Herb. i. 85 (1890) = ANTIPHYTUM PENINSULARE (Rose) Johnston, Contr. Gray Herb. n. s. lxviii. 51 (1923).

Krynitzkia plebeia Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS PLEBEJUS (Cham.) Johnston, Contr. Gray Herb. n. s. lxviii. 77 (1923).

Krynitzkia pustulata Blankinship, Mont. Agric. Coll. Sci. Studies, Bot. i. 96 (1905) = OREOCARYA AFFINIS Greene, Pittonia iii. 110 (1896).

Krynitzkia Scouleri Gray, Proc. Am. Acad. xx. 267 (1885) = PLAGIOBOTHRYS SCOULERI (H. & A.) Johnston, Contr. Gray Herb. n. s lxviii. 75 (1923).

Krynitzkia sericea Gray, Proc. Am. Acad. xx. 279 (1885) = OREOCARYA SERICEA (Gray) Greene, Pittonia i. 58 (1887).

Krynitzkia sericea, var. *fulvocanescens* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 710 (1895) = OREOCARYA FULVOCANESCENS (Gray) Greene, Pittonia i. 58 (1887).

Krynitzkia setosissima Gray, Proc. Am. Acad. xx. 276 (1885) = OREOCARYA SETOSISSIMA (Gray) Greene, Pittonia i. 58 (1887).

Krynitzkia trachycarpa Gray, Proc. Am. Acad. xx. 266 (1885) = PLAGIOBOTHRYS TRACHYCARPUS (Gray) Johnston, Contr. Gray Herb. n. s. lxviii. 78 (1923).

Krynitzkia virgata Gray, Proc. Am. Acad. xx. 279 (1885) = OREOCARYA VIRGATA (Porter) Greene, Pittonia i. 58 (1887).

PIPTOCALYX MOOREI Oliver in Benth. Fl. Austral. v. 292 (1870).—A shrubby Australian plant belonging to the *Monimiaceae*, cf. Perkins & Gilg, Pflanzenr. iv. Fam. 101, 22–23 (1901).

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Manning, M. H. 160 Torreyana v. genuina (38a).

Mathews, W. 40 crassisepala (24).

Merrill, E. D., & Wilcox, E. N. 873 circumscissa v. genuina (10a); 842 Torreyana v. genuina and ambigua (38a and 40).

Metcalfe, O. B. 52 crassisepala (24); 1573 pterocarya v. cycloptera (19b).

Munz, P. A. 2214 Clevelandi v. florosa (50b); 5784 intermedia (28); 6076 echinella (41).

Munz, P. A., & Harwood, R. D. 3299 Clevelandi v. genuina (50a); 3472 intermedia (28); 3587, 3601a costata (6).

Munz, P. A., & Johnston, I. M. 5176 nevadensis v. genuina (30a); 5317 intermedia (28); 5346 microstachys (48).

Munz, P. A., Johnston, I. M., & Harwood, R. D. 4222 gracilis (44); 4241 utahensis (17); 4281 barbigera (29).

Munz, P. A., & Keck, D. 4755 maritima v. genuina (16a); 4757 barbigera (29); 4763 angustifolia (8).

Nelson, A. 304 minima (23); 412, 672 Kelseyana (22); 672 Watsoni (43); 1335 Kelseyana (22); 1523 Fendleri (45); 1684, 3080 Watsoni (43); 3171 Kelseyana (22); 3510 Fendleri (45); 4683 scoparia (31); 5275 Fendleri (45); 7280 Kelseyana (22); 7611 Fendleri (45); 8731, 8888 ambigua (40); 8897, 9049, 9377a, 9415 Kelseyana (22).

Nelson, A., & Macbride, J. F. 1215 Torreyana v. genuina (38a); 1311 scoparia (31); 1527 Watsoni (43); 1703 scoparia (31); 1739 pterocarya v. genuina (19a); 1773 ambigua (40); 1801 scoparia (31); 2151 Torreyana v. genuina (38a); 2231 scoparia (31).

Nelson, A., & Nelson, E. 5761 Watsoni (43); 5761a ambigua (40); 5887 Pattersoni (20); 6224 Torreyana v. genuina (38a); 6440 ambigua (40); 6546 Torreyana v. genuina (38a); 6886, 7670 Fendleri (45).

Nelson, E. 851 ambigua (40); 859 circumscissa v. genuina (10a).

Nelson, E. W. 6343 albida (11).

Nelson, J. C. 1254, 1369 Hendersoni (36); 1377 flaccida (54); 1414, 2083, 2109, 2166 Hendersoni (36); 2222 flaccida (54); 3093 Hendersoni (36); 3096 flaccida (54); 3253, 4869 Hendersoni (36); 4893 flaccida (54).

Nevin, J. C. 57a flaccida (54); 57b, 57c microstachys (48).

Orcutt, C. R. 15 echinosepala (13); 27, 52, 80 Gravi v. genuina (9a); 1022, 1127 muricata v. Jonesii (32b); 1277 microstachys (48); 1278 intermedia (28); 1279 nevadensis v. genuina (30a); 1281 muricata v. Jonesii (32b); 2257 maritima v. genuina (16a); 2264 barbigera (29).

Osterhout, G. 3425 Fendleri (45); 3464 Kelseyana (22); 3464, 3559b Pattersoni (20); 6188 Kelseyana (22).

Palmer, E. 26 echinosepala (13); 28 pusilla (5); 41 simulans (39); 65 pusilla (5); 67 maritima v. genuina (16a); 68 foliosa (27); 72 gracilis (44); 139 pusilla (5); 150 decipiens v. genuina (25a); 169 angustifolia (8); 183 affinis (56); 188 racemosa (2); 204 scoparia (31); 227 pusilla and albida (5 and 11); 241 angustifolia (8); 242 echinosepala (13); 243 albida (11); 257 intermedia (28); 343

albida (11); 346 pterocarya v. cycloptera (19b); 348 barbigera (29); 350 nevadensis v. genuina (30a); 352 utahensis (17); 371 micrantha v. genuina (7a); 372 circumscissa v. genuina (10a); 376 muricata v. genuina (32a); 397 Grayi v. cryptochaeta (9c); 551 maritima v. pilosa (16c); 606 angustifolia (8); 608 intermedia (28); 691 maritima v. cedrosensis (16b); 695 intermedia (28); 780 barbigera (29); 781 maritima v. genuina (16a); 801 Gravi v. genuina (9a); 842 foliosa (27); 846 racemosa (2); 877 foliosa (27); 879 maritima v. genuina (16a); 896 albida (11); 912 maritima v. genuina (16a); 2046 albida (11); 2142 maritima v. pilosa (16c).

Pammel, L. H., & Blackwood, R. 3895 Torreyana v. genuina (38a).

Parish, S. B. 3337 racemosa (2); 3645 microstachys (48); 3660 intermedia (28); 4850 nevadensis v. genuina (30a); 6940 intermedia (28); 8124 angustifolia (8); 8429 costata (6); 9798 maritima v. pilosa (16c); 9810 dumetorum (14); 9855 holoptera (1); 9859 inaequata (4); 9869 barbigera (29); 10005, 10050 maritima v. pilosa (16c); 10125 racemosa (2); 10138 pterocarya v. genuina (19a); 10238 pterocarya v. genuina (19a); 11117 intermedia (28); 11118 muricata v. Jonesii (32b); 11154 intermedia (28); 11299 intermedia (28).

Parish, S. B., & Parish, W. F. 771 micrantha v. genuina (7a); 771a micrantha v. lepida (7b); 775 racemosa (2); 929 intermedia and muricata v. Jonesii (28 and 32b); 1215 intermedia (28).

Parish, W. F. 167 pterocarya v. cycloptera (19b).

Parry, C. C. 14,164 micrantha v. genuina (7a); 165 circumscissa v. genuina (10a); 171 barbigera (29).

Parry, C. C., & Lemmon, J. G. 279½ simulans (39).

Parry, C. C., & Palmer, E. 623 albida (11).

Patterson, H. N. 111 Kelseyana and minima (22 and 23); 112 Fendleri (45).

Payson, E. B. 296 minima (23) - 395 gracilis (44).

Payson, E. B., & Armstrong, G. M. 3324, 3392 Torreyana v. genuina (38a).

Payson, E. B., & Payson, L. B. 1756 Torreyana v. genuina (38a); 2535 Kelseyana (22); 2546 Pattersoni (20); 2628 Torreyana v. genuina (38a).

Peck, M. E. 1369½, 1416 Torreyana v. genuina (38a); 3587 Watsoni (43); 3607 ambigua (40); 3609 Torreyana v. genuina (38a); 3995 Hendersoni (36); 6108 circumscissa v. genuina (10a); 8473 Hendersoni (36); 8691, 8755 leiocarpa (46); 9264 simulans (39); 9295 Torreyana v. genuina (38a); 9313 affinis (56); 9447 Torreyana v. genuina (38a); 9709 circumscissa v. genuina (10a); 9710 ambigua (40).

Pendleton, R. L. 907 flaccida (54).

Piper, C. V. 295 Fendleri (45); 372 Hendersoni (36); 1702 flaccida (54); 1941, 1944 Hendersoni (36); 1945 Torreyana v. genuina (38a); 2961 pterocarya v. genuina (19a); 2966 circumscissa v. genuina (10a); 3091 Torreyana v. genuina (38a); 3092 affinis (56); 3887 flaccida (54); 4140 Torreyana v. genuina (38a); 5030 scoparia (31); 5044 Torreyana v. genuina (38a); 5018, 5043, 5105, 5106, Hendersoni (36).

Pond, C. F. 21 maritima v. genuina (16a).

Pringle, C. G. 184 pusilla (5); 6648, 8301 albida (11).

Purpus, C. A. 126 albida (11); 1294, 1707 flaccida (54); 2402 albida (11); 5304 circumscissa v. hispida and circumscissa v. genuina (10a, b); 5369 oxygona (18); 5433 utahensis (17); 5692 flaccida (54); 5712 circumscissa v. genuina (10a); 5825 pterocarya v. cycloptera (19b); 5825a oxygona (18); 5841 circumscissa v. genuina (10a); 5856 recurvata (12); 5897 oxygona (18); 5921 gracilis (44); 5986 utahensis and pterocarya v. genuina (17 and 19a); 6024 racemosa (2); 6077 echinella (41); 6488 recurvata (12); 6610 Fendleri (45).

Rattan, V. 6 micromeres (15); 19 flaccida (54); 42 Torreyana v. genuina (38a); 43 intermedia (28).
Ramaley, T., & Robbins, W. W. 3575 Watsoni (43).
Reverchon, J. 2120 minima (23).
Roadhouse, F. E. 54 Clevelandi v. florosa (50b).
Robinson, O. W., & Crocker, H. 998 intermedia (28).
Rothrock, J. F. 88 intermedia (28).
Rydberg, P. A., & Bessey, E. A. 4885, 4886, 4887, 4889 ambigua (40).
Rydberg, P. A., & Garrett, A. O. 9681 Fendleri (45).
Rydberg, P. A., & Vreeland, F. K. 5697 minima (23).
Rusby, H. H. 285 barbigera (29); 745 micrantha v. genuina (7a); 747 gracilis (44); 750 Fendleri (45).

Sandberg, J. H., & Leiberg, J. B. 121 Torreyana v. genuina (38a); 173 flaccida (54); 228 circumscissa v. genuina (10a); 248 Watsoni (43); 260 pterocarya v. genuina (19a); 304 flaccida (54).
Sandberg, J. H., MacDougal, D. T., & Heller, A. A. 163 flaccida (54); 351 Torreyana v. genuina (38a).
Schaffner, J. G. 731 albida (11).
Seaton, H. E. 173 albida (11).
Seler, E., & Seler, C. 5304 albida (11).
Sharples, S. P. 195, 197 affinis (56).
Sheldon, E. P. S10866 Hendersoni (36).
Shockley, W. H. 69 utahensis (17); 81 Watsoni (43); 260 recurvata (12); 282 pterocarya v. genuina (19a); 288 nevadensis v. genuina (30a); 347, 650 utahensis (17).
Smart. 126 barbigera (29); 132 pterocarya v. cycloptera (19b); 141 crassisepala (24).
Smiley, F. J. 219 affinis (56); 820 circumscissa v. genuina (10a).
Smith, L. E. 211 flaccida (54).
Spencer, M. F. 36, 37 intermedia (28); 38 muricata v. Jonesii (32b); 184 nevadensis v. genuina (30a); 187 barbigera (29); 188 nevadensis v. genuina (30a); 189 barbigera (29); 190 pterocarya v. cycloptera (19b); 191 barbigera (29); 194 micrantha v. genuina (7a); 195a, 198 maritima v. genuina (16a); 195, 196, 197 angustifolia (8); 200 pterocarya v. cycloptera (19b); 200a barbigera (29); 201 angustifolia (8); 254 racemosa (2); 290, 294 intermedia (28); 345 muricata v. Jonesii (32b); 387 circumscissa v. genuina (10a); 389, 403, 411 nevadensis v. rigida (30b); 415 oxygona (18); 419 nevadensis v. rigida (30b); 436 micrantha v. genuina (7a); 438 nevadensis v. genuina (30a); 555 nevadensis v. rigida (30b); 838 intermedia (28); 843 angustifolia (8); 844 micrantha v. genuina (7a); 846, 847 pterocarya v. cycloptera (19b); 848 nevadensis v. genuina (30a); 849 angustifolia (8); 850, 851, 852 intermedia (28); 853, 855 angustifolia (8); 856 pterocarya v. cycloptera (19b); 857 micrantha v. genuina (7a); 858 micrantha v. lepida (7b); 859 nevadensis v. genuina (30a); 862 barbigera (29); 863, 920, 921, 922, 923, 929, 938, 1112 intermedia (28); 1178 muricata v. Jonesii (32b); 1179 intermedia (28); 1301 micrantha v. lepida (7b); 1302, 1303 muricata v. Jonesii (32b); 1304 micrantha v. genuina (7a); 1305 microstachys (48); 1306 muricata v. Jonesii (32b); 1347 micrantha v. lepida (7b); 1348, 1349, 1350 intermedia (28); 1512 angustifolia (8); 1513 barbigera (29); 1514 costata (6); 1515 micrantha v. genuina (7a); 1516 barbigera (29); 1517 angustifolia (8); 1518 intermedia (28); 1519 barbigera (29); 1520 maritima v. genuina (16a); 1522 decipiens v. genuina (25a); 1523 maritima v. genuina (16a); 1524 costata (6); 1525 nevadensis v. genuina (30a); 1526 utahensis (17); 1526a angustifolia (8); 1527 costata (6); 1528 maritima v. pilosa (16c); 1781 muricata v. Jonesii (32b); 1782 utahensis (17); 1783 intermedia (28); 1785 angustifolia (8); 1918 micrantha v. genuina (7a); 1950 maritima v. genuina (16a); 2063 intermedia (28); 2065a ptero-

carya v. cycloptera (19b); 2065b intermedia (28); 2066a angustifolia (8); 2066b holoptera (1); 2067, 2068, 2069 maritima v. genuina (16a); 2070 holoptera (1); 2071a maritima v. pilosa (16c); 2071b angustifolia (8); 2072 decipiens v. genuina (25a); 2073, 2074, 2075, 2076 utahensis (17); 2075 intermedia (28); 2078, 2079 racemosa (2); 2079 pterocarya v. cycloptera (19b); 2082 utahensis (17); 2083 intermedia (28); 2084 pterocarya v. genuina (19a); 2087 intermedia (28); 2088 maritima v. genuina (16a); 2089 barbigera (29); 2091 angustifolia (8); 2092 barbigera (29); 2093 utahensis (17); 2117 simulans (39); 2118 angustifolia (8); 2275 intermedia (28).

Stevens, G. W. 245, 282, 598, 616, 664, 3040 minima (23).

Suksdorf, W. N. 46 simulans (39); 179 affinis (56); 180 Hendersoni (36); 181 simulans (39); 220 Clevelandi v. florosa (50b); 404 circumscissa v. genuina (10a); 405 scoparia (31); 406 ambigua (40); 455 affinis (56); 456 Hendersoni (36); 593 Torreyana v. genuina (38a); 594 ambigua (40); 595 simulans (39); 789 Torreyana v. genuina (38a); 889 pterocarya v. genuina (19a); 1494 scoparia (31); 1495, 2346 rostellata (53); 2768, 3207 affinis (56); 3278 Hendersoni (36); 7757 Clevelandi v. florosa (50b).

Summers, R. W. 598 hispidissima (47); 598, 899 Clevelandi v. florosa (50b).

Thornber, J. J. 407, 516 angustifolia (8).

Thurber, G. 61 crassisepala (24); 181 micrantha v. genuina (7); 690 angustifolia (8).

Tidestrom, I. 9026 pterocarya v. genuina (19a).

Torrey, J. 329 flaccida (54); 330 Torreyana v. genuina (38a); 331 affinis (56); 332 circumscissa v. genuina (10a); 333 flaccida (54); 335 ambigua (40); 336 circumscissa v. genuina (10a); 337 Torreyana v. genuina (38a).

Toumey, J. W. 240a crassisepala (24).

Tracy, J. P. 439 flaccida (54); 761 micromeres (15); 793 Torreyana v. pumila (38c); 1653, 1731 Torreyana v. genuina (38a); 1744 Hendersoni (36); 1809 hispidissima (47); 1865 Torreyana v. calistogae (38b); 1879 Torreyana v. genuina (38a); 1880 flaccida (54); 2054, 2060 Torreyana v. pumila (38c); 2074 micromeres (15); 2094 Torreyana v. calistogae (38b); 2457 leiocarpa (46); 2758 flaccida (54); 3071 Torreyana v. genuina (38a); 3335 Hendersoni (36); 3655, 3944, 4301, 4560 Torreyana v. genuina (38a).

Tracy, S. M., & Earle, F. S. 105 pusilla (5); 176 albida (11).

Trask, B. 57 Traskae (37); 56, 57 maritima v. genuina (16a).

Tucker, S. 127 Torreyana v. genuina (38a).

Vasey, G. R. 421 pterocarya v. genuina (19a); 434 Kelseyana (22); 434a Fendleri (45).

Vorhies, C. T. 124 Fendleri (45).

Walker, E. P. 155 minima (23).

Ward, L. F. 1231 gracilis (44).

Ware, R. A. 2690c glomeriflora (57).

Watson, S. 286a ambigua (40); 847, 848 circumscissa v. genuina (10a); 850 nevadensis v. genuina (30a); 856 micrantha v. genuina (7a); 858 Torreyana v. genuina and Watsoni (38a and 43); 859 pterocarya v. genuina (19a).

Wilson, N. C. 170 racemosa (2).

Wright, C. 488 albida and texana (11 and 21); 1565 micrantha v. genuina (7a); 1570 pterocarya v. cycloptera (19b); 1571 pusilla (5); 1572 albida (11).

Wright, W. G. 11 simulans (39); 98 intermedia (28); 1764, 1770 pterocarya v. cycloptera (19b).

Xantus, J. 76 Grayi v. cryptochaeta (9c); 84 microstachys (48); 85 decipiens v. corollata and nevadensis v. rigida (25b and 30b).

Yates, H. S. 402 Hendersoni (36).

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

NEW SERIES.—LXXV.

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I. RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—V.

By B. L. Robinson.

In the course of the past year the writer's attention to the *Eupatorium* tribe has been chiefly directed to the preparation of a keyed recension of the shrubby and arborescent species of the genera of *Eupatorium* and *Ophryosporus* for Mr. P. C. Standley's well known and very useful enumeration of the woody plants of Mexico. In the course of this work it has been necessary to reach at least provisional decisions regarding some of the early and obscure Mexican species, as well as to segregate certain inconsistent elements traditionally associated with broadly interpreted species like *Eupatorium calaminthaefolium* HBK.

The writer has also had the privilege of examining the entire material of the American *Eupatorieae* from the Botanical Museum of Copenhagen most kindly lent for study. This collection is exceptionally rich in the plants of southern Mexico, Costa Rica, portions of the West Indies, Venezuela, and Brazil, since it includes unusually complete sets of the valuable Liebmann, Oersted, Warming and Eggers series, as well as much West Indian and tropical American material of earlier date.

Another loan of *Eupatorieae determinandae* has been received from the Museum of Natural History in Paris, including highly interesting plants of Gaudichaud, d'Orbigny, Weddell, and Triana.

Further progress has been made on the identification of loans from the Royal Gardens at Kew, the University of Geneva, the New York Botanical Garden, the United States National Herbarium, the Missouri Botanical Garden, and the Field Museum of Natural History mentioned in previous papers of this series.

Prof. Hans Schinz, Director of the Botanical Garden and Museum at Zurich, has kindly supplied helpful specimens of the horticultural Eupatoriums cultivated at his establishment.

So far as diagnoses and notes have resulted from the study of these collections during the past year they are recorded below.

An extended and exceedingly interesting collection of Eupatoriums, obtained during Dr. Ekman's intensive exploration of Cuba, has been referred to the writer by Prof. I. Urban for identification, but arrived too late for the inclusion of its new species in the present paper. It is hoped that they may be put on record in the succeeding number of this series.

PIQUERIA CUMINGII Robinson, Proc. Am. Acad. xlii. 11 (1906). Further material of this little known species has been seen in a recent loan from the Paris Museum of Natural History. It consists of an unnumbered specimen collected at Cobija, Chile, by Gaudichaud in 1846 (Par., phot. Gr.). In habit and essential features it agrees closely with the type, but its leaves (sometimes 3-nerved) are as much as 8 mm. wide and the heads but 2–3-flowered.

Ophryosporus petraeus, comb. nov. *Eupatorium petraeum* Robinson, Proc. Am. Acad. xli. 275 (1905). From further study of the proper boundary between the genera *Eupatorium* and *Ophryosporus* it now seems clear that this and the following species are best referred to the latter genus. In both these species the summit of the connective is slightly expanded and thickened, but the anthers have no membranaceous appendage, a feature universal *Eupatorium*. Furthermore, the style-branches in these species are perceptibly knobbed at the tip, a trait characteristic of *Ophryosporus*. The occasional occurrence of one or two narrow and caducous pales on the outer portion of the very small disk has not been found a character of sufficient definiteness or constancy to be of use in the classification of this group. As to habit these species go quite as appropriately with *Ophryosporus* as with *Eupatorium*, for in the latter they approach only *E. polybotryum* DC. and *E. microcephalum* Gray, species which are not satisfactorily distinguishable from each other or from *Ophryosporus alternifolius* (DC.) Benth. & Hook. f. and which for similar reasons should be referred to *Ophryosporus* rather than *Eupatorium*.

O. scabrellus Robinson, comb. nov. *Eupatorium scabrellum* Robinson, Proc. Am. Acad. xxxv. 339 (1900).

ALOMIA MYRIADENIA (Sch.-Bip.) Bak. in Mart. Fl. Bras. vi. pt. 2, 192 (1876). To this well marked species belongs Glaziou's no. 15,154 (if one may judge from its representation in the Botanical Museum of Copenhagen), a number listed by Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 391 (1909), as *Eupatorium betonicaeforme* Bak. Re-examination of several specimens of *Alomia myriadenia* shows that its achenes, which are black and shining, are consistently attached to the receptacle at their slightly incurved base by an unusually large yellowish-white somewhat hook-shaped, reniform or slightly sigmoid callosity 0.6–0.7 mm. in length. Baker, l. c., describes this species as suffruticose but a specimen collected on the Serra da Piedade by Reinhardt (Copenh.) shows it flowering and fruiting at a height of 3 dm. with a single erect essentially herbaceous stem and a root of the annual type. Other specimens show that the species attains a greater stature, but none thus far seen by the writer shows lignescence.

Eupatorium angustissimum, var. *goyazense* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, p. 387 (1909), without diagnosis. In mentioning this undescribed variety in the list of his plants collected in central Brazil Glaziou indicates that it came from Vargem de Chico Costa in Goyaz, that it was based on his no. 21,615, and that it had been deposited in the herbaria of Paris, Berlin and Kew. Interpreted from the Kew isotype, kindly lent to the writer for examination, Glaziou's variety proves to have 8–10-ribbed achenes, which are rather densely short-villous. It is clear that these are not the achenes of *Eupatorium angustissimum* Spreng., nor indeed of the genus *Eupatorium* at all. On the other hand the specimen corresponds in all important characters and nearly all minor details with BRICKELLIA BRASILIENSIS (Spreng.) Robinson, var. PERNAMBUCENSIS Robinson, from which it appears to differ only in having somewhat shorter and uniformly entire leaves.

E. (§ **Subimbricata**) **Bakerianum**, nom. nov. *E. cinereum* Bak. Journ. Bot. xx. 226 (1882), not Linnaeus f., Raf., nor Griseb. The specific name used by Baker having homonyms of earlier date, at least one of which is still by some writers maintained as valid, must of course give place to some more distinctive designation. In selecting such a name it is a pleasure to commemorate in this species the notable work of Mr. J. G. Baker whose treatment of *Eupatorium* in the Flora Brasiliensis forms probably the most important single contribution to the knowledge of the genus since the publication of the fifth volume of De Candolle's Prodromus in 1836.

E. calophyllum (Greene), comb. nov. *Kyrstenia calophylla* Greene, Leaf. i. 11 (1903). This plant of Coahuila, San Luis Potosi and Hidalgo has long passed as a mere form of *E. calaminthaefolium* HBK., but in the light of the material of both now available it appears probable that they are separable species rarely if at all intergrading. In *E. calaminthaefolium* the leaves are membranaceous or nearly so, and obscurely reticulated; in *E. calophyllum* they are coriaceous or firmly fleshy and curiously scrobiculate. In both species there is glandular punctation on the leaves but these glands tend to be differently arranged. In *E. calaminthaefolium* they are mostly found in the ultimate areolae of the netted veinlets, while in *E. calophyllum* the glands are nearly all along the (often elevated and slightly scored) veinlets. While in inflorescence and floral details, these species are much alike, such distinctness of foliage combined with difference of range, makes it pretty certain that they are best treated as distinct species..

E. (§ EXIMBRICATA) ESPINOSARUM, var. **doratophyllum**, nom. nov., formam typicam multis simulans differt foliis lanceolatis vel ovato-lanceolatis 2.5–3 cm. longis 9–13 mm. latis nec rite ovatis ut apud formam vulgarem.—*E. Robinsonianum* Greene, Erythea, i. 150 (1893).—MEXICO: cañon walls and ledges near Lake Chapala, Jalisco, 18 Nov. 1892, *Pringle*, no. 4353 (TYPE, Gr.); Tequixquiac, 30 Aug. 1903, *Rose & Painter*, no. 6625 (Gr.). This variety possesses the glutinous quality of the typical form, though perhaps in somewhat slighter degree.

E. (§ **Eximbricata**) **etlense** Robinson, spec. nov., fruticosum graciliter ramosum; ramis subteretibus brunnescente griseis; ramulis costulatis crispe puberulis vel granulatis; foliis oppositis ovatis obtusis vel breviter acuminatis crenatis vel crenato-serratis basi rotundatis vel subcordatis saepe obliquis 2.5–6 cm. longis 1.7–4.2 cm. latis membranaceis subconcoloribus vel distincte subtus pallidioribus supra parcissime pubentibus subtus villosis a basi 3–5-nervatis; venulis minute reticulatis pulcherrime translucentibus; venulis in areolis inclusis libris; petiolo gracili 7–32 mm. longo; corymbis (immaturis) subdensis valde convexis ca. 4 cm. diametro griseo-pubescentibus; capitulis pedicellatis 22–23-floris 8 mm. longis; involucri squamis ca. 20 lanceolato-linearibus acutis subaequalibus (1–3 extimis exceptis) ca. 4 mm. longis dorso griseo-pubescentibus; corollis albis glabris 4.5 mm. longis gradatim a tubo gracili in fauces paullo ampliatis; dentibus limbi patentibus deltoideis ca. 0.6 mm. longis; achaeniis 2 mm. longis obscure puberulis vel glabris; pappi setis ca. 20 albis capillaribus corolla distincte brevioribus.—MEXICO: Las Sedas, District of Etla, Oaxaca, alt. 1900 m., 20 Oct. 1907, *Prof. C. Conzatti*, no. 2071–2072 (TYPE, U. S. Nat. Herb., phot. and fragm. Gr.). A slender shrub of rather characteristic habit and with leaves exhibiting in transmitted light a close and striking pellucid reticulation in which there are free veintips in the areolae.

E. (§ **Eximbricata**) **eucosmoides**, spec. nov., fruticosum vel herbaceum et perenne (basi ignota) inflorescentia excepta glaberrimum; caule (vel ramo) tereti rubro-brunneo arcuato ca. 3 mm. diametro albo-medulloso; internodiis 3–4 cm. longis; foliis oppositis petiolatis anguste ovatis acuminatis obscure cuspidato-denticulatis basi acutis vel subacutis supra basin pinnatim ca. 7-nervatis firmiter membranaceis utrinque glaberrimis minute reticulatis (venis utrinque subimpressis) infra paullo pallidioribus 6–7 cm. longis 3–4 cm. latis; petiolo 9–15 mm. longo; panicula terminali breviter pyramidata ca. 1 dm. alta et 13 cm. crassa; paniculae ramulis obscure lanulosis; bracteolis

subulatis; inflorescentiae partialibus corymbiformibus rotundatis densiusculis; capitulis ca. 30-floris ca. 8 mm. longis et 9 mm. diametro; involucri squamis linearibus subacutis vix imbricatis subglabris firmiusculis; corollis 3.5–4 mm. longis subcylindratis sine faucibus distinctis; dentibus limbi ca. 0.4 mm. longis; achaeniis ca. 2 mm. longis paullo hispidulis; pappi setis ca. 20 capillaribus vix scabratis ca. 3 mm. longis.—PERU: *Mathews*, no. 1123 (Par., phot. and small fragm. Gr.). This sheet now in the Museum of Natural History at Paris is one of a collection of plants secured in the interior of Peru by Alexander Mathews and by him given or sold to Gaudichaud while, as botanist of the Bonite, he visited Peru in 1836–37. The species bears some habital similarity to the Bolivian *E. eucosmum* Robinson, but that has sharply toothed leaves, shorter, broader, phyllaries and fewer-flowered heads.

E. (§ **Eximbricata**) **hebes**, spec. nov., fruticosum ut videtur erectum (basi ignota) oppositirameum saltim post exsiccationem sordide vel fulvescente brunnescens; foliis oppositis deltoideo-ovatis vel rite ovatis subintegris apice et angulis lateralibus obtusissimis rotundatis supra rugulosis obscure puberulis subtus pallidioribus fulvo-brunneis minute reticulatis paullo supra basin 3-nervatis in venulis hirtellis et cum glandulis ornatis 2–3.2 cm. longis 1.5–3 cm. latis subchartaceis; petiolo foliorum caulinum maturorum ca. 12 mm. longo glandulari-hispido; corymbis terminalibus planiusculis ca. 8 cm. diametro; capitulis maturitate 8–9 mm. longis ca. 13-floris pedicellatis; involucri squamis lanceolatis acutis ca. 4.5 mm. longis vix imbricatis dorso puberulo-granulatis brunnescentibus; corollis ca. 5 mm. longis glabris; tubo proprio gracili ca. 1 mm. longo; faucibus gradatim ampliatis 3 mm. longis; dentibus limbi anguste ovatis ca. 0.7 mm. longis; achaeniis nigris deorsum attenuatis ca. 2.5 mm. longis sursum griseo-hispidulis; pappi setis ca. 30 corollam subaequantibus sordide albis capillaribus barbellato-scabratis.—MEXICO: "Meoatlan, S. Andres," October, 1842, *Liebmann*, no. 75 in chief part (TYPE, Bot. Mus. Copenhagen, phot. and fragm. Gr.).

By Schultz-Bipontinus this was regarded as a variety of *E. calaminthaefolium* HBK., but it differs from that species in many respects, as for instance in its much larger flatter inflorescences, and subentire leaves of firmer texture without glandular punctation.

Two varieties of this plant were associated by Liebmann under his no. 75. These may be distinguished as follows:

Var. **typicum**, caule ramisque subteretibus; caule et ramis et inflorescentia minute granuloso-puberulis et cum pilis articulatis glan-

dulari-capitulatis patentibus dense vestitis.—Liebmann's no. 75 in greater part.

Var. **rasum**, var. nov., caule (juventate) sulcato-angulato; caule et inflorescentia minutissime pulverulo-puberulis sine pilis glandularibus patentibus.—Liebmann's no. 75 in small part.

These varieties correspond in other respects very precisely and their differences are of a nature frequently exhibited by plants of the same species. Although intergradation between them has yet to be demonstrated it can be confidently anticipated.

E. (§ **Eximbricata**) **hidalgense**, spec. nov., fruticosum 9–15 dm. altum primo aspectu glabrum sed in novellis minute crispeque purpureo-puberulum copiose ramosum saepe furcatum (axibus repetite abortivis et ab ramis superatis); caulibus ramisque fusco-griseis teretibus; foliis oppositis rhombeo-oblongis apice angustatis sed obtusis vel rotundatis basi acutis subintegris vel integerrimis minutissime puberulis supra viridibus subtus pallidioribus et minute punctatis supra basin 3-nervatis, 1.5–3 cm. longis 1–1.5 cm. latis; petiolo 2–5 mm. longo; corymbis numerosis planiusculis 3–6 cm. latis; capitulis pedicellatis 8–13-floris 8–10 mm. altis ca. 7 mm. diametro; involucri squamis linearibus ad apicem obtusum angustatis 4–5 mm. longis saepe purpurascentibus ciliolatis glandulari-granulatis; corollis albis glabris; tubo proprio 1.5 mm. longo; faucibus cylindratis 3–4 mm. longis; dentibus limbi ovato-oblongis acutis 0.8 mm. longis; achaeniis nigris ca. 3 mm. longis gracilibus cum glandulis globosis sessilibus numerosis ornatis; pappi setis ca. 40 inaequalibus saepissime roseis.—MEXICO: Sierra de Pachuca, alt. 2900 m., 22 Aug. 1902, *Pringle*, no. 9903 (TYPE, Gr., distributed as *E. calaminthaefolium*), and 8 Sep. 1899, *Pringle*, no. 7958 (Gr.); on rocky soil in mountain woods, El Chico near Pachuca, Sep. 1905, *Purpus*, no. 1490 (Gr., distributed as *E. erythropappum* and mixed with *E. lucidum*); Zimapan, *Coulter*, no. 269 (Gr., mixed with a *Steria*); between Pachuca and Real del Monte, *Rose & Painter*, no. 6671 (Gr., U. S.).

This species has leaves either entire or undulately 3–5-toothed toward the apex. In shape they differ much from those of *E. calaminthaefolium* HBK. and in nervation and much smaller size are readily distinguishable from those of *E. erythropappum* Robinson, a plant which is probably only a form of the variable *E. ligustrinum* DC.

E. (§ **Eximbricata**) **irrasum**, comb. nov., fruticosum valde ramosum; ramis teretibus atrogriseis glabratis; ramulis crispe puberulis vel tomentellis; foliis parvis oppositis petiolatis ovatis vel suborbicularibus obtusissimis integris vel paucicrenatis basi rotundatis supra

viridibus breviter pubescentibus subtus griseo-tomentosis 7–15 mm. longis 5–16 mm. latis; corymbis numerosis in ramulis terminalibus plerisque 3–9-capitulatis valde convexis; capitulis ca. 10–12-floris ca. 11 mm. altis; involucri squamis ca. 11 lanceolato-linearibus acutis 5.5 mm. longis dorso griseo-pubescentibus purpurascentibus; corollis purpureis glabris ad 5.5 mm. longis; tubo proprio ca. 2 mm. longo; faucibus distincte ampliatis subcylindratis 3.5 mm. longis; dentibus limbi anguste ovatis acutis 0.7 mm. longis; achaeniis gracilibus 3.4–3.8 mm. longis argute pentagonis hispidis; pappi setis ca. 35 capillaribus scabratis corollam subaequantibus vel etiam paullo superantibus.—*E. calaminthaefolium*, var. *irrasum* Robinson, Contr. Gray Herb. lxviii. 11 (1923).—MEXICO: on the Cordillera in Oaxaca, alt. 2135 m., *Galeotti*, no. 2022 (TYPE, Par., phot. Gr.); barren hills about Esperanza, Puebla, alt. 2660 m., *Pittier*, no. 435 (U.S.); from same locality, *Purpus*, no. 2457 (Gr., U.S.).

Further study of this and the nearly related Eupatoriums of Mexico makes it clear that they are better treated as a group of independent species of close affinities rather than as varieties or forms of *E. calaminthaefolium* as they have long been referred in herbaria. They are differentiated and keyed in another paper now in press.

E. LIGUSTRINUM DC. Prod. v. 181 (1836). *E. micranthum* Lag. as doubtfully interpreted by Lessing, Linnaea, v. 138 (1830), but surely not *E. micranthum* Lag. Gen. et Spec. 25 (1816), which is stated to have had many-flowered heads, subimbricate involucre, and sky-blue corollas, and was presumably an *Ageratum* of the *A. corymbosum* group. *E. semialatum* Benth. Pl. Hartw. 76 (1840). *E. myriadenium* Schauer, Linnaea, xix. 721 (1847). *E. Weinmannianum* Regel & Koern. Ind. Sem. Hort. Petrop. 1857, p. 41 (1857). *E. biceps* Klotzsch ex Vatke, Bot. Zeit. xxx. 719 (1872), where many horticultural synonyms of this species are indicated. *E. popocatapetlense* "Schl." ex Hemsl. Biol. Cent.-Am. Bot. ii. 99 (1881), a binomial somewhat doubtfully ascribed to Schlechtendal by Hemsley but probably originating in a very similar though not precisely identical name used in herbaria but never published by Schultz-Bipontinus.—This species, extensively grown as a greenhouse plant, runs in cultivation into several horticultural forms differing in compactness of habit as well as in the texture, size, and contour of the leaves. Botanical varieties do not appear to have been described, but the following, occurring in nature and being readily distinguishable, may well be put on record.

Var. **typicum**, in inflorescentia breviter puberulum non villiferum; foliis subtus obscure puberulis penniveniis.

Var. **villiferum**, var. nov., in ramulis et petiolis et inflorescentia tum villiferum tum puberulum; foliis utrinque pubescentibus pinnatim 3–5-nervatis potius quam penniveniis.—MEXICO: on mountains near Carneros Pass, Coahuila, alt. 2600 m., 15 Sept., 1889, *Pringle*, no. 2465 (TYPE, in Gray Herb.), distributed as *E. popocatapetlense;* region of San Luis Potosi, 1878, *Parry & Palmer*, nos. 335 (Gr.), distributed as *E. glaucum* Sch.-Bip., and 346 (Gr.).

E. (§ **Praxelis**) **odontodactylum**, spec. nov. *E. capillare*, var. *Riedelii* (Sch.-Bip.) Bak. in Mart. Fl. Bras. vi. pt. 2, 341 (1876). *Praxelis Riedelii* Sch.-Bip. ex Bak. l. c., not *Eupatorium Riedelii* (Sch.-Bip.) Bak. In his studies of the Brazilian Eupatoriums the writer has seen many specimens of the delicate annual *E. capillare* (DC.) Bak. It has been found quite uniform in possessing entire and very narrow leaf-segments not 0.5 mm. in width and very obscurely if at all punctate; the heads are subcylindric and nearly always nodding on their capillary pedicels. From that plant the one called var. *Riedelii* by Baker seems to differ so clearly and constantly as to merit recognition as a separate species. It is a somewhat stouter plant with shorter internodes. Its leaf-segments, especially the middle ones, are distinctly toothed. They are lance-linear instead of filiform and become sometimes as much as 2 mm. wide. The heads are more campanulate in form and are in general erect. Furthermore the leaves are distinctly punctate. The name *Riedelii* employed by Schultz for this plant under *Praxelis* being already occupied in *Eupatorium*, it becomes needful to give the species a new name. Riedel's no. 1405 collected "in saxosis humidis prope Ypanema," Jan. 1826 (Gr.) may be taken as the type.

E. (§ **Subimbricata**) **Ortegae**, spec. nov., fruticosum oculo nudo laeve; caulibus ramisve teretibus gracilibus purpurascenti-griseis; internodiis 2.5–7 cm. longis; foliis oppositis graciliter petiolatis deltoideo-ovatis acuminatis basi abrupte angustatis vel subtruncatis lateraliter argute paucidentatis chartaceo-coriaceis utrinque laete viridibus et cum venulis prominentibus reticulatis ima a basi 3-nervatis supra glaberrimis subtus obscure in nervis granulato-puberulis 3.5–8.5 cm. longis 2.5–5 cm. latis; petiolo 1.5–3 cm. longo supra canaliculato; panicula terminali oppositiramea ovoidea 5–14 cm. alta et crassa; capitulis ca. 28-floris ca. 7 mm. longis et 6 mm. diametro ad apices paniculae ramorum in corymbos valde convexos aggregatis; pedicellis cum bracteolis lineari-subulatis attenuatis ornatis; involucri squamis ca. 18 lanceolato-linearibus attenuatis subglabris dorso 1-sulcatis; corollis albis glabris; tubo sine faucibus

distinctis ca. 3 mm. longo; dentibus limbi anguste deltoideis ca. 0.7 mm. longis; achaeniis atrobrunneis glabris 2.8 mm. longis; pappi setis ca. 20–25 albis corollam subaequantibus.—MEXICO: La Bajada, Tamazula, Durango, alt. 300–600 m., Nov. 1921, *J. G. Ortega*, no. 4449 (TYPE, Gr. U.S.).

This neat and attractive shrub is most nearly related to *E. Haenkeanum* DC. but differs in its firmer brighter green strongly reticulated leaves and much narrower and attenuate phyllaries.

E. PACHYPODUM Robinson, Proc. Am. Acad. xxxvi. 481 (1901). This little known and presumably very local species was described from material collected by Pringle, 26 May, 1891, on rocky hills near Guadalajara. In this the leaves were subsessile and very small, not above 1.3–1.8 cm. in length, being much exceeded by the internodes. It has recently been possible for the author to re-examine the species in a specimen lent him from the Botanical Museum at Copenhagen. This was collected by Mr. Pringle also near Guadalajara but later in the season, being gathered 27 Oct., 1903. It shows leaves as much as 3 cm. in diameter, mostly equalling or somewhat exceeding the internodes, finely and prominently reticulated and of firm texture, their petioles being 3–3.5 mm. long.

E. (§ **Eximbricata**) **porriginosum**, spec. nov., copiose et fastigiatim ramosum fruticosum 9–15 dm. altum; caule tereti tardius glabrato a cortice grisea tecto; ramis ramulisque crispe puberulis erectis vel adscendentibus foliosis; foliis oppositis petiolatis parvis ovalibus vel integerrimis vel utroque latere 1–3-serrato-dentatis apice basique obtusis vel rotundatis membranaceis subtus paullo pallidioribus utrinque sparce puberulis et punctatis saepissime in pagina superiori obscure albido-maculatis quasi lepidotis 1–2 cm. longis 7–15 mm. latis; corymbis numerosis paucicapitulatis umbelliformibus; pedicellis 1–1.8 cm. longis saepe capitula longitudine superantibus; capitulis ca. 15-floris 10–12 mm. longis; involucri squamis anguste lanceolatis quam flosculi dimidio brevioribus acutis dorso crispe puberulis pallide viridibus saepe purpureo-tinctis; corollis vel albis vel roseo-purpureis glabris; tubo proprio gracili fauces cylindratas ampliatas subaequante; achaeniis brunneis dense breviterque hispidulis; pappi setis saepe roseis corollam subaequantibus.—MEXICO: bluffs of barranca above Santa Fe, Federal District, alt. 2440 m., *Pringle*, no. 6552; San Angel near Mexico, *Bourgeau*, no. 170 (Gr., Univ. Geneva); dry mesas near Metepec Station, Hidalgo, 22 June, 1904, *Pringle*, no. 13,047 (TYPE, in Gray Herb.); Cerro Verde, Oaxaca, *Purpus*, no. 3136 (Gr.). All these specimens have been distributed as *E. cala-*

minthaefolium HBK. They are manifestly close to that species in their affinities but differ in several traits. In *E. calaminthaefolium*, as shown by the original plate and by a photograph of the type, the leaves are of a broader more suborbicular form, in fact often broader than long. They tend to be somewhat larger and more deeply and crenately toothed, and of slightly more chartaceous texture. They lack the characteristic though somewhat faint maculation on the upper surface. There are perceptible differences also in the inflorescence and it seems probable that the plants, though in many respects similar, are distinct species. This group of low shrubs is keyed and described in another paper now in press.

E. (§ **Eximbricata**) **rhodopodum,** spec. nov., fruiticosum verisimiliter erectum primo aspectu glabrum sed superne parce patenterque pilosum, pilis articulatis; caule tereti pallide brunneo; ramis oppositis adscendentibus atropurpureis; foliis oppositis brevissime petiolatis late ovatis vel ovato-oblongis acutis vel obtusiusculis aut integris aut undulatis aut in latere uno vel utroque 1–5-dentatis glaberrimis vel cum ciliis raris ornatis concoloribus paullo supra basin 3-nervatis impunctatis 2–3 cm. longis 1.3–2 cm. latis coriaceis; petiolo 1–2 mm. longo crasso purpureo-rubro; corymbis terminalibus planiusculis vel convexis 3–6 cm. latis fastigiatis; pedicellis 1–1.5 cm. longis rectiusculis hirtellis; capitulis ca. 25-floris, ca. 9 mm. longis et crassis; involucri squamis ca. 18 lanceolatis acutis glabris viridibus; disco planiusculo nudo; corollis albis vel paullo roseis glabris; tubo proprio ca. 1 mm. longo; faucibus subcylindratis distincte ampliatis 3.5 mm. longis; dentibus limbi ovatis subacutis 0.7 mm. longis; achaeniis nigris deorsum descrescentibus 2–2.5 mm. longis; pappi setis ca. 30 pulcherrime roseis ca. 3.5 mm. longis.—MEXICO: Minas de San Rafael, San Luis Potosi, Nov. 1910, *Dr. C. A. Purpus*, nos. 4792 (TYPE, in Gray Herb.), distributed as *E. popocatapetlense;* and 4796 (U.S.), distributed as *E. calaminthaefolium*.

From both the species to which this plant has been referred it can be readily distinguished by its scarcely petioled leaves. It is much more nearly related to *E. glaucum* Sch.-Bip. but that has much smaller mostly 1-nerved leaves of more elliptic form and about 14-flowered heads.

E. STACHYOPHYLLUM Spreng. Syst. iii. 420 (1826). In a loan of undetermined *Eupatorieae* recently received from the Paris Museum of Natural History for study and identification is a specimen of this species bearing the following data: Bolivia: Prov. Santa Cruz, Nov. 1845, *H. Alg. Weddell*, no. 3561. This is, it is believed, the first re-

corded occurrence of *E. stachyophyllum* in Bolivia. The species, while constant in essentials, is notably variable in leaf-breadth. The Bolivian plant here cited has broad elliptic-ovate leaves, of which the larger are 4.8–5.3 cm. long and 3–4 cm. wide.

E. (§ **Eximbricata**) **subintegrum** (Greene), comb. nov. *E. Espinosarum*, var. *subintegrifolium* Robinson, Proc. Am. Acad. xxvi. 165 (1891). *Kyrstenia subintegra* Greene, Leafl. i. 10 (1903). While closely related to *E. Espinosarum* Gray, this vernicose Mexican shrub, now known from several consistent collections, is found to differ in having longer heads fully 1 cm. high, more attenuate and relatively narrower phyllaries, as well as subentire and more gradually acuminate leaves. It is believed that Greene's treatment of it as an independent species is justifiable. However, *Kyrstenia* to which he referred this plant is merely a rather weak section of *Eupatorium*. The needed combination under *Eupatorium* is therefore here recorded. It will be noted that Greene is transferring *E. Espinosarum*, var *subintegrifolium* to *Kyrstenia* changed the name to *subintegra*. This, being accordingly the first designation for the plant in the specific category, must be maintained by those who treat it as an independent species even though there is an earlier varietal name.

E. (§ **Eximbricata**) **thysanolepis**, spec. nov., suffrutescens brunneo-tomentosum 3–5 dm. altum in parte superiori copiose ramosum; ramis patenter adscendentibus foliosis; caule tereti dense breviterque brunneo-tomentoso ad 5 mm. diametro; foliis oppositis vel ternatis (supremis aliquando subalternis) petiolatis ovatis subacutis vel saepius obtusis undulatis vel leviter serratis (dentibus paucis 0.2–0.8 mm. altis inter se 4–6 mm. distantibus) basi integris obtusis vel rotundatis firmiter membranaceis supra puberulis vel pulverulentis nigrescentibus subtus brunneo-tomentosis fere a basi 3-nervatis 1.5–5.5 cm. longis 1–4 cm. latis; petiolo dense tomentoso 3–10 mm. longo; corymbo terminali basi folioso composito; capitulis 50–60-floris ca. 15 mm. altis et crassis; involucri squamis ca. 25 subaequilongis oblongis vel lanceolato-linearibus dorso brunneo-pubescentibus apicem versus in margine laceratis et vel acutiusculis vel in appendicem paullo dilatatis et obtusis 5–8 mm. longis; corollis albidis (Glaziou) glabris ca. 6 mm. longis gradatim a basi ad limbum ampliatis sine faucibus distinctis; achaeniis gracilibus saepius curvatis minutissime granulatis ca. 3 mm. longis; pappi setis ca. 25 sordide albidis ca. 4 mm. longis.—BRAZIL: Itacolumy near Ouro Preto, Minas Geraes, Dec. to Jan., *Glaziou*, no. 8135 (TYPE, in Bot. Mus. Copenhagen, phot. and small fragm. Gr.); also nos. 15,152 and 20,369 both in Bot. Mus. Copenhagen; also Serra da Stabira do Campo, *Lund* (Copenh.).

This is the plant which Baker took for *E. hebecladum* DC. and his description in the Flora Brasiliensis clearly relates to it and not at all to the De Candollean type. The latter, photographed at Geneva by the writer in 1905, is quite a different plant with relatively narrower leaves, which, as originally described by De Candolle, are acuminate at apex, truncate at base, and coarsely many-toothed. The inflorescence is spherical and raised distinctly above the leaves. Though these plants possess some points of similarity their differences are of a pronounced nature and they are certainly distinct species.

E. (§ **Eximbricata**) **ymalense**, spec. nov., fruticosum vel arborescens; caule tereti ad 1.5 cm. vel ultra crasso; cortice pallide griseo aetate suberoso firmo longitudinaliter rugoso; ramis ascendenter patentibus juventate flavido-brunneis costulatis pubescentibus; foliis oppositis petiolatis ovato-oblongis acuminatis primo aspectu integerrimis sed remote obscurissime cuspidato-denticulatis utrinque parce pubescentibus vix subtus pallidioribus 7–11 cm. longis 3–6 cm. latis membranaceis 3-nervatis; petiolo gracili 7–9 mm. longo; corymbis plurimis valde convexis in paniculam laxiusculam elongatam vel ampliatam foliaceo-bracteatam dispositis; capitulis ca. 13-floris, 6–7 mm. altis graciliter pedicellatis saepe nutantibus; involucri squamis ca. 14 subaequalibus linearibus caudato-attenuatis; corollis subtubulatis 4–4.5 mm. longis albescentibus glabris limbum versus granulatis; antheris apice distincte appendiculatis; achaeniis atrogriseis sublaevibus cum costis pallidioribus; pappi setis ca. 40 capillaribus flavescente albidis vix scabratis corollas subaequantibus.—*E. albicaule*, var. *laxius* Robinson, Proc. Am. Acad. xxxv. 330 (1900).—Mexico: Ymala, Sinaloa, 16–25 Aug., 1891, *Dr. Edward Palmer* no. 1474 (type, Gray Herb.; isotype, Mus. Bot. Copenhagen). The membranaceous rather than coriaceous leaves of this plant as well as the attenuate involucral scales show differences from *E. albicaule* Sch.-Bip. which seem amply to warrant its separation as a distinct species.

Kanimia goyazensis, spec. nov., herbacea virgata ubique breviter crispeque pubescens; radice fibrosa; caule virgato erecto vel brevissime imam ad basin subdecumbenti dense folioso ca. 3 dm. alto, internodiis plerisque vix 1 cm. longis; foliis numerosis ascendentibus imbricatis oppositis vel subopppositis subsessilibus lanceolato-oblongis integris vel apicem acutum vel obtusum vel etiam rotundatum versus obscure paucidentatis basi cuneatis penniveniis sed paullo supra basin obscure 3–5(–7)-nervatis utrinque breviter pubescentibus subtus prominenter reticulato-venosis 1.5–4 cm. longis 5–14 mm. latis; petiolo vix 2 mm. longo; inflorescentia juventate ovoidea maturitate

subcorymbosa et planiuscula ca. 8 cm. diametro basi foliaceo-bracteata; capitulis glomeratis sessilibus 4-floris 1 cm. vel ultra longitudine; bracteola lanceolato-lineari attenuata ca. 6 mm. longa ad capitulum arcte approximata; involucri squamis obovato-oblongis acutis ca. 8–9 mm. longis 2–2.6 mm. latis dorso tomentellis ca. 5-nervatis; corolla (immatura) ca. 6 mm. longa; tubo proprio gracili ca. 2 mm. longo; faucibus modice ampliatis ca. 1.8 mm. longis; dentibus limbi oblongis ca. 2.2 mm. longis; achaeniis (immaturis) breviter griseo-villosis 8–10-costatis 3.5 mm. longis 1.5 mm. diametro; pappi setis ca. 115 flavido-albidis ca. 7 mm. longis obscure scabratis.—*Eupatorium stachyophyllum* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, p. 388, in part, not Spreng.—BRAZIL: between As Bracas and Os Ciganos, Goyaz, *Glaziou*, no. 21,635 (TYPE, K., phot. and fragm. Gr.). A well marked species with very leafy stems unbranched up to the inflorescence, sessile leaves strongly reticulated beneath, and rather large (though still immature) heads. *Eupatorium stachyophyllum* Spreng., under which name this plant was listed, is of course very different, with smaller heads, pluriseriate involucre and 5-angled achenes.

II. THE OENOTHERAS OF NORTHWESTERN SOUTH AMERICA.

By P. A. Munz and I. M. Johnston.

THE present paper is concerned with the Oenotheras of Bolivia, Peru, Ecuador, Colombia and Venezuela. The principal portion of the work upon it was done at the Gray Herbarium. Through the courtesy of Dr. N. L. Britton, Dr. W. R. Maxon and Mr. J. F. Macbride, we were allowed to examine, in addition to the available specimens in the Gray Herbarium (G), loans of material from the New York Botanical Garden (NY), United States National Herbarium (US), and the Field Museum of Natural History (FM). Subsequently the senior author visited, and studied the Oenotheras in, the herbaria at Yale University (Y), Philadelphia Academy (Ph), and Missouri Botanical Garden (Mo). Consequently the greater portion of the pertinent material available in the United States has been reviewed in the preparation of this synopsis. No pretense, however, is made to finality in the present treatment. Not until much more material is available from the area, and until the baffling complexities of the Argentine and Chilian species are understood can a satisfactory account of the northern Andean species be written.

Key to Species and Varieties.

Capsule broadest above the middle and frequently more or less winged, clavate. § *Hartmannia*.
- Petals 2–3 cm. long; body of capsule 1–1.5 cm. long, very broadly winged, long-villous ..... 1. *Oe. tetraptera*.
- Petals 0.5–1 cm. long; body of capsule 5–9 mm. long, with poorly developed rather thick wings if any, pubescence usually short.
  - Petals deep pink or purple; plant erect or ascending, more or less branched above; fruit not curved ..... 2. *Oe. rosea*.
  - Petals yellow or greenish; stems prostrate or decumbent, subsimple; fruit usually strongly curved.
    - Seeds large, ca. 1–1.5 mm. long; plant usually glabrate; leaves usually subcoriaceous, subentire; s. Ecuador to Bolivia ..... 3. *Oe. multicaulis*.
    - Seeds small, ca. 0.5–0.9 mm. long; plant usually pubescent on upper parts of stem; leaves usually thick-herbaceous, somewhat denticulate; c. Ecuador to Venezuela and Mexico ..... 3a. *Oe. m.* var. *tarquensis*.

Capsule cylindrical or if not then broadest above middle.
- Seeds ovoid, not at all angular; capsule subterete or obscurely angled. § *Raimmania*.
  - Plant densely caespitose, low and rounded; leaves numerous in close tufts, linear-lanceolate, repand-dentate; capsules crowded near base of plant, obscured by leaves, ca. 15 mm. long ..... 4. *Oe. punae*.
  - Plant evidently caulescent with leaves and flowers scattered along stem.
    - Plant perennial, decidedly woody at base; petals 2–2.5 cm. long; pubescence closely and densely strigose; sepal-tips corniculate, ca. 2 mm. long; style densely pubescent near base ..... 5. *Oe. Featherstonei*.
    - Plant annual or at most biennial, herbaceous throughout; sepal-tips undeveloped or frequently ca. 1 mm. long (in no. 7 ca. 2 mm. long); pubescence villous or none.
      - Petals 1–1.5 cm. long; hypanthium 20–30 mm. long; plant commonly freely branched from base; stems usually decumbent below, finely pubescent or villous, floriferous only above middle; seeds usually pitted, brown or ashy ..... 6. *Oe. laciniata*.
      - Petals 4–7 mm. long; hypanthium 5–15 mm. long.
        - Plant freely branched from base; branches decumbent, floriferous only above middle; plant dark green, finely pubescent; seeds yellowish, rather smooth; style glabrous ..... 6a. *Oe. l.* var. *limensis*.
        - Plant simple, erect, usually floriferous to base.
          - Hypanthium ca. 15 mm. long; sepal-tips 1–2.5 mm. long; plant green tinged with red, conspicuously villous; seeds brown, evidently pitted; style glabrous ..... 7. *Oe. arequipensis*.
          - Hypanthium 5–8 mm. long; sepal-tips ca. 1 mm. long; plant yellow-green, practically glabrous; seeds yellowish, rather smooth; style sparsely villulose near base ..... 8. *Oe. verrucosa*.

Seeds more or less prismatic, evidently angular; capsule strongly angled. § *Euoenothera.*
Petals 4–5 cm. long; capsule fusiform, 3–4 cm. long, base evidently narrowed, not noticeably ensheathed by leaf-base ..... 9. *Oe. fusiformis.*
Petals 0.5–2.5 cm. long; capsule oblong or ovate-oblong, 1.5–3 cm. long, base broad and more or less ensheathed by leaf-base.
Petals 0.5–0.9 mm. long; plant usually pallid with a fine strigose pubescence; capsule four times as long as thick..... 10. *Oe. rubida.*
Petals 1.2–2.5 cm. long; plant usually green, glabrate or somewhat villous.
Hypanthium 5–9 cm. long; capsule four to six times as long as thick; fresh flowers yellow..... 11. *Oe. elongata.*
Hypanthium 1–3(–6) cm. long; capsule two to three times as long as thick; fresh flowers reddish or yellow..... 12. *Oe. campylocalyx.*

1. OENOTHERA TETRAPTERA Cav. Icones iii. 40, t. 279 (1795). *Xylopleurum tetrapterum* Raim. in E. & P. Pflanzenf. iii. Abt. 7, 214 (1893). *Hartmannia tetraptera* Small, Bull. Torr. Bot. Cl. xxiii. 181 (1896). *Oe. tetraptera* f. *chenopodifolia* Lévl. Monog. 122 (1902). *H. macrantha* Spach, Nouv. Ann. Mus. Paris iv. 363 (1835); Hist. Veg. iv. 372 (1835).—VENEZUELA: La Puerta, Trujillo, 2000 m. alt., *Jahn 1137* (US); near Colonia Tovar, *Fendler 451* (G, ISOTYPE of f. *chenopodifolia* Lévl.).—Most common in Mexico; occurring within our limits only in northern Venezuela.

2. OE. ROSEA Aiton, Hort Kew. ed. 1, ii. 3 (1789). *Hartmannia rosea* G. Don in Sweet, Hort. Brit. ed. 3, 236 (1839). *Xylopleurum roseum* Raim. in E. & P. Pflanzenf. iii. Abt. 7, 214 (1893). *Oe. rubra* Cav. Icones iv. 68, t. 400 (1797). *Oe. virgata* R. & P. Fl. Peruv. iii. 79, t. 315 (1802). *H. virgata* Spach, Nouv. Ann. Mus. Paris iv. 361 (1835). *H. gauroides* Spach, Nouv. Ann. Mus. Paris iv. 363 (1835); Hist. Veg. iv. 371 (1835). *H. affinis* Spach, Ann. Sci. Nat. ser. 2, iv. 167 (1835). (?) *Oe. epilobiifolia* HBK. Nov. Gen. et Sp. vi. 92 (1823). (?) *H. epilobiifolia* Spach, Nouv. Ann. Mus. Paris iv. 364 (1835).—Ecuador to Chile; reported by Léveillé, Monog. 113, from Venezuela. Occurs from southeastern United States to Costa Rica, also in Cuba, and in eastern Brazil.—BOLIVIA: Cotaña, 2450 m. alt., *Buchtien 148* (G, FM), *5984* (US); La Granga, 2600 m. alt., *Bro. Julio 115* (US); Sorata, *Williams 1548* (US), *Mandon 630* (G), *Rusby 1814* (G, FM, US); Capi, *Bang 779* (G, Mo, US); near Mapiri, *Bang 1746* (G, FM, Mo, US); without locality, *Bang 2007* (NY). PERU: Torontoy, Urubamba Valley, 2400 m. alt., *Cook & Gilbert 820* (US); Oroya, *Kalenborn 144* (NY, US); Rimac, 1882, *Ball* (G); San

Damian, 2400–3000 m. alt., 1913, *Hrdlicka* (US); Lima, 150 m. alt., *Macbride & Featherstone 61* (G, FM); Lima, purchased in market, *Cook & Gilbert 2086* (US); Huanuco, 2100 m. alt., *Macbride & Featherstone 2062* (G, FM). ECUADOR: Chuquiribamba, *André 3980* (NY, FM); Azogues, *Rose & Rose 22800* (US); Cuenca, *Rose, Pachano & Rose 22927* (US).

3. OE. MULTICAULIS R. & P. Fl. Peruv. iii. 80, t. 317 (1802). *Xylopleurum multicaule* Loesener in Fedde, Repert. xii. 237 (1913). *Oe. multicaulis*, var. *petiolaris* Ball, Jour. Linn. Soc. xxii. 38 (1885). *Oe. Barbeyana* Lévl. Monog. 43, cum tab. (1902). *Hartmannia boliviana* Rusby, Descr. S. Am. Pl. 72 (1920).—Bolivia to southern Eucador.—BOLIVIA: Songo, *Bang 914* (G, NY, FM, Mo, US, Ph, ISOTYPES of *Oe. Barbeyana* Lévl.); near Sorata, 4000 m. alt., *Mandon 632* (G, NY); Titicaca Island, 3840 m. alt., *Buchtien 2922* (NY, TYPE of *H. boliviana* Rusby; US, ISOTYPE). PERU: Puno, 3125 m. alt., *Shepard 147* (G); Cuzco, *Rose 19489* (US); Ollantaytambo, 3000 m. alt., *Cook & Gilbert 345* (US), *1901* (US); Obrajillo, *Wilkes Exped.* (G, US); 25 km. S. E. of Huanuco, 3150 m. alt., *Macbride & Featherstone 2136* (G, FM); Rio Blanco, 3600 m. alt., *Macbride & Featherstone 746* (G, FM); Cuzco, 3000–3600 m. alt., 1923, *Herrera* (US). ECUADOR: Zaragura, *Rose, Pachano & Rose 23163* (G, NY, US); (? immature) Cuenca, *Rose, Pachano & Rose 22942* (US).—Very variable in the form and size of fruit. The only definite character capable of decisively separating it from the more northern plant usually referred to *Oe. tarquensis* HBK. appears to be the larger size of the seeds. The Bolivian and Peruvian material available has seeds averaging much larger than that from further north, with the exception of one fruiting collection from southern (Zaragura) Ecuador, which has seeds indistinguishable from typical *Oe. multicaulis*. While usually indicative, the other characters mentioned in the key are not at all constant.

3a. **Oe. multicaulis**, var. **tarquensis** (HBK), comb. nov. *Oe. tarquensis* HBK. Nov. Gen. et Sp. vi. 91 (1823). *Hartmannia tarquensis* Spach, Nouv. Ann. Mus. Paris iv. 363 (1835). *Oe. ascendens* Willd. in Spreng. Syst. ii. 230 (1825).—Central Ecuador to Venezuela; also in Mexico.—ECUADOR: near Quito, *Orton* (G), *Rose & Rose 23533* (G, NY, US), *Holway 939* (US), *Jameson 26* (NY) and *355* (G); Pichincha, 3000 m. alt., 1855, *Couthouy* (G, Y, NY), *Jameson 119* (NY); Ambato, *Pachano 191* (US); San Francisco, 15 km. N. E. of Ambato, 2550 m. alt., *Tate 563* (US); Baños, prov. of Tungurahua, 1950 m. alt., *Tate 612* (US); Tulcán, Prov. Carchi, 2500 m. alt., *Hitchcock 20998* (US, NY); without locality, *Spruce*

5059 (G), *Jameson* (US). COLOMBIA: Coconuco, Dept. El Cauca, 2300–2500 m. alt., *Killip 6844* (NY, US); Huancabamba, *André K1054* (FM); Bogota, 2600–2700 m. alt., *Pennell 2330* (G, NY, US); Bogota, *Holton 890* (G, NY); Zipacon, Dept. Cundinamarca, 2500 m. alt., *Rusby & Pennell 1216* (NY, US). VENEZUELA: Paramo de Santo Domingo, Mérida, 3600 m. alt., *Jahn 1093* (US); Paramo de La Sal, Mérida, 3400 m. alt., *Jahn 593* (US).—This variety is quite indistinguishable from *Oe. cuprea* Schlecht., Linnaea xii. 269 (1838), from the high volcanoes of southern Mexico and Guatemala. In fact some of the cited material has been distributed under that name.

4. OE. PUNAE Kuntze, Rev. Gen. iii. pt. 2, 99 (1893). *Raimannia punae* Sprague & Riley, Kew Bull. 201 (1921). *Oe. Mandoni* Lévl. Monog. 43 (1902); 359 (1909). *Oe. Kuntziana* Lévl. Monog. 43, cum tab. (1902); 359 (1909).—Western Bolivia and adjacent Peru.—BOLIVIA: Escayarhe near Tarija, *Frebrig 3030* (Mo); La Paz, 3900 m. alt., *Buchtien 644* (US, NY); La Paz, 4000 m. alt., *Mandon 631* (NY, ISOTYPE of *Oe. Mandoni* Lévl.); Nyuni, 3700 m. alt., *Asplund 5981* (US); Challapata, 3900 m. alt., *Asplund 5982* (US); Guagui, 3900 m. alt., *Asplund 5983* (US). PERU: Puno, prov. Huancané, *Shepard 86* (G).—Although Léveillé insists, l. c. 43 and 359, that his *Oe. Mandoni* was published simultaneously with Kuntze's *Oe. punae*, and that Kuntze had admitted the fact, we have been unable to discover a publication of the name *Oe. Mandoni* earlier than 1902, about nine years after the launching of *Oe. punae* Kuntze. Judging from description this species is closely related to, if not identical with, *Oe. nana* Griseb., Abhandl. Gesellsch. Wiss. Goett. xix. 143 (1874), a species occurring in the high country of northern Argentina.

5. **Oe. Featherstonei**, sp. nov., perennis; caulibus prostratis frutescentibus 4–7 mm. crassis apicem versus ascendentibus 2–3 dm. altis in partibus junioribus minute canescente pubescentibus; foliis numerosis 1–3 cm. longis 3–8 mm. latis lanceolatis concoloribus puberulentis remote dentatis apice acutis basim versus in petiolum 1–4 mm. longum attenuatis, superioribus vix reductis; floribus ut videtur paucis axillaribus conspicuis; hypanthio 25–30 mm. longo canescente minuteque pubescenti subtubiformi; sepalis ca. 15–17 mm. longis extus dense minute pubescentibus cum apicibus corniculatis 2 mm. longis conspicuis ornatis; petalis flavis late triangulari-obovatis ca. 22–25 mm. longis et latis apice truncato-obtusis basim versus gradatim contractis; staminibus subaequalibus; filamentis filiformibus 13–14 mm. longis; antheris 6–7 mm. longis linearibus medium versus dorsaliter affixis; stylo infra medium pu-

bescenti ca. 4 cm. longo cum stigmate 4-lobato coronato; lobis stigmatis teretibus ca. 2 mm. longis; capsulis sessilibus 23–25 mm. longis obtuse quadrangularibus rectis vel falcatis saepe ascendentibus supra medium saepe incrassatis ca. 3.5 mm. crassis; seminibus ca. 1.5 mm. longis brunneis vix variolatis ellipsoideis nullo modo angulatis.—PERU: sprawling on disintegrated granite slope, Matucana, Lima, *Macbride & Featherstone 270* (TYPE, Field Mus. no. 516,803; ISOTYPE, Gray Herb.).—Obviously a member of the § *Raimannia*, but very different from the middle and northern Andean species in its woody perennial habit and large flowers. It seems rather closely related to the confused and poorly understood group of pampean species although it is rather far removed from them geographically.

6. OE. LACINIATA Hill, Veg. Syst. xii. 64 (1767); Hort. Kew. 172[4] cum tab. (1769). *Oe. sinuata* L. Mant. ii. 228 (1771). *Oe. prostrata* R. & P. Fl. Peruv. iii. 79, t. 315 (1802). *Oe. psychrophila* Ball, Jour. Linn. Soc. xxii. 38 (1885). *Oe. Stuebelii* Hieron. in Engler, Jahrb. xxi. 327 (1895).—Peru and Ecuador; widely distributed in Mexico and eastern United States.—PERU: near Lima, 1882, *Ball* (G); Baños, *Wilkes Exped.* (US); Mito, Prov. Huanuco, 2700 m. alt., *Macbride & Featherstone 1528* (G, FM); Chacapoyas, *Mathews* (NY); Rimac, 1500–1600 m. alt., 1882, *Ball* (NY); Rimac, 1200 m. alt., 1887, *Safford* (NY); without locality, 1862, *Mathews* (NY); without locality, *Wilkes Exped.* (US, NY). ECUADOR: Cotocollas, *Mille 398* (US); Quito, *Hartweg 982* (NY); Quitensian Andes, 1855, *Couthouy* (G, NY); Andes, *Spruce 5039* (G).—A careful comparison of material from North and South America has failed to reveal any characters by which the plants from the two continents can be distinguished nor any reason for recognizing the proposed segregates among the southern plants.

6a. **Oe. laciniata**, var. **limensis**, var. nov., differt a forma typica floribus minoribus; petalis 7 mm. longis; hypanthio 10–12 mm. longo; seminibus flavescentibus.—PERU: on sandy hills along the sea, Lurin, Lima, *Macbride 5950* (TYPE, Field Mus. no. 536,954; ISOTYPE, Gray Herb.).—A peculiar variation of *Oe. laciniata* characterized by its small flowers and yellowish seeds.

7. **Oe. arequipensis**, sp. nov., annua herba erecta simplex foliosa villosa saepe rubro-tincta 10–25 cm. alta; foliis 2–3 cm. longis 5–9 mm. latis subsessilibus lanceolatis vel lineari-lanceolatis valde irregulariterque dentatis concoloribus; floribus in axillis omnibus etiam ab infimis ad summa gestis; alabastro erecto ellipsoideo-obovoideo villoso 6–7 mm. longo; hypanthio 14–15 mm. longo subtubulari quam

lato 10-plo longiori; sepalis 5–7 mm. longis anthesi separatim reflexis lanceolatis apicem versus 1–2.5 mm. longe corniculatis; petalis ca. 4–6 mm. longis suborbicularibus flavis (?) in sicco rosaceis; filamentis compresse filiformibus subaequalibus ca. 4–5 mm. longis; antheris ca. 2 mm. longis oblongis dorsaliter medium versus affixis; stylo glabro ca. 17–18 mm. longo; stigmate 4-lobato lobis ligulatis ca. 2 mm. longis; capsulis 15–20 mm. longis ca. 3.5 mm. crassis obtusi-quadrangularibus basim et apicem versus abrupte contractis subsessilibus cum valvis medialiter longitudinaliterque costatis; seminibus ascendentibus biseriatis ovoideis brunnescentibus ca. 1 mm. longis variolatis.—PERU: sandy slopes, desert hills, Mollendo, Arequipa, *Hitchcock 22403* (TYPE, U. S. Nat. Herb. no. 1,196,655).—Although eventually this peculiar plant may prove to be only a phase of *Oe. verrucosa* it differs in so many respects from that species that it seems best to treat it here as a distinct species. We doubtfully refer to this species a single dwarf specimen in the National Herbarium that was collected at Luisa, Ecuador, by Rose & Rose (no. 23907). It differs from the type of *Oe. arequipensis* in being subacaulescent and in having more nearly entire leaves and less well developed sepal-tips. The plant mentioned is a peculiar one and more material of it is a great desideratum.

8. OE. VERRUCOSA Johnston, Contr. Gray Herb. n. s. lxx. 77 (1924). —PERU: southern slope of El Chachani near Arequipa, *Hinckley 17* (G, TYPE).—No further information regarding this species has accumulated since its recent publication.

9. **Oe. fusiformis**, sp. nov., herbacea ut videtur perennis; caulibus canescentibus minute pubescentibus et sparse villosis teretibus; foliis superioribus lanceolatis ca. 10 cm. longis 15 cm. latis minute pubescentibus pallidis concoloribus margine irregulariter undulatis apice acutis basim versus in petiolum ca. 5 mm. longum attenuatis; floribus spicatis flavis bracteatis; bracteis lanceolatis sessilibus 1–3 cm. longis; ovario cylindrico glandulari-pubescenti ca. 1 cm. longo; hypanthio ca. 4 cm. longo ca. 1 mm. crasso graciliter tubuloso glandulari-pubescenti; sepalis 3–3.5 cm. longis lanceolatis bini reflexis extus glandulari-pubescentibus, apicibus ca. 2 mm. longis erectis teretibus; petalis flavis 4–5 cm. longis 3–4 cm. latis obovatis basi attenuatis apice obtusis vel rotundis; staminibus 8 aequalibus; filamentis filiformibus ca. dimidium petalorum aequantibus; antheris linearibus dorsaliter medialiterque affixis ca. 13 mm. longis; stylo 7.5–8.5 cm. longo glabro; stigmate 4-partito lobis linearibus 8 mm. longis; capsulis fusiformibus 3–4 cm. longis 4–5 mm. crassis sessilibus sparse

pubescentibus brunnescentibus obtuse quadrangularibus apice 3–5 mm. longe rostratis cum valvis medialiter longitudinaliterque costatis; seminibus angulatis brunneis ca. 2 mm. longis.—ECUADOR: field between El Tambo and La Toma, Prov. Loja, 1000–2200 m. alt., *Hitchcock 21350* (TYPE, U. S. Nat. Herb. no. 1,196,309).—Among South American species well characterized by its large flowers, fusiform capsules and angled seeds.

10. OE. RUBIDA Rusby, Bull. N. Y. Bot. Gard. viii. 110 (1912).—PERU: Arequipa, 2250 m. alt., *Williams 2524* (NY, TYPE); slopes of El Chachani north of Arequipa, 2400 m. alt., *Hinckley 68* (US).—Apparently a local species and perhaps too close to one of the following.

11. OE. ELONGATA Rusby, Mem. Torr. Bot. Cl. iii. 33 (1893). *Oe. serratifolia* Krause in Fedde, Repert. i. 168 (1905).—BOLIVIA: vicinity of La Paz, 3300 m. alt., *Bang 54* (NY, TYPE; G, Ph, US, Mo, ISOTYPES); La Paz, 3550 m. alt., *Buchtien 77* (G, NY, FM); La Paz, 3550 m. alt., *Buchtien 39* (US).—We know *Oe. serratifolia* only from description. The type of this apparently synonymous species came from extreme southern Bolivia in the vicinity of Tarija.

12. OE. CAMPYLOCALYX Koch & Bouché, Ind. Sem. Hort. Berol. app. 17 (1855). *Oe. versicolor* Lehm. Ind. Sem. Hort. Hamb. 7 (1855); Linnaea xxviii. 359 (1856). *Oe. coccinea* Britt. Bull. Torr. Bot. Cl. xvii. 213 (1890). *Oe. scabra* Krause in Fedde, Repert. i. 168 (1905). *Oe. Weberbaueri* Krause, l. c. 169. *Onagra fusca* Krause, l. c. 167. *Oe. fusca* Sprague & Riley, Kew Bull. 1921: 199 (1921).—Ecuador to Peru and northern Argentina.—BOLIVIA: Tarija, *Fiebrig 3358* (G); Ingenio del Oro, 3000 m. alt., *Rusby 1815* (NY, TYPE of *Oe. coccinea*); *Rusby 1976* (NY); Sorata, 2650–3000 m. alt., *Mandon 627* (G); Titicaca Island, 3840 m. alt., *Buchtien 4661* (US), *2921* (NY, US); La Paz, 3800 m. alt., *Buchtien 532* (US); Cochabamba, 2700 m. alt., *Buchtien 2387* (US); "Rio Juntas," 2000 m. alt., *Kuntze* (NY). PERU: Ollantaytambo, 3000 m. alt., *Cook & Gilbert 628* (US), *294* (US); Oroya, 3300–3600 m. alt., *Kalenborn 241* (NY, US); Cuzco, 3000–3600 m. alt., *Herrera* (US); Rio Blanco, 3600 m. alt., *Macbride & Featherstone 681* (G, FM), *721* (FM, G); Yanahuanca, 3000 m. alt., *Macbride & Featherstone 1250* (G, FM); Huacachai near Muña, 1950 m. alt., *Macbride 3884* (G, FM). ECUADOR (?): Guanojo, *André* 3965 (NY).—This species appears to be the most common evening primrose in Peru and Bolivia. It is readily recognized by its very thick short capsules and usually reddish petals. Léveillé, under the name of *Oe. Simsiana*, has given a photograph of a quite typical specimen. *Oenothera sandiana* Hassk., Flora

xxxix. 516 (1856), from near Sandia in extreme southeastern Peru may prove to be a synonym of this species although the fruit is described as subcylindrical.

Excluded and Unidentified Species.

Oe. perampla Graham, Edinb. New Philos. Journ. 1832: 362 (1832).—Given as probably collected [by Cruckshanks] near Lima. Judging from the lengthy description, this species is a synonym of Oe. acaulis Cav., a Chilean species widely distributed in the region in which Cruckshanks is known to have collected.

Oe. pubescens Willd. in Spreng. Syst. ii. 229 (1825).—"*Amer. aust.* Humb."—Unrecognized. Perhaps a species of *Jussiaea.*

Oe. fruticosa L. is reported from Ecuador by Léveillé, Monog. 106 (1902), but we have seen nothing suggesting it from South America.

III. FURTHER NEW PLANTS COLLECTED BY MRS. RICHARD C. CURTIS IN TROPICAL AFRICA.

By Ivan M. Johnston.

In a former paper, Contr. Gray Herb. n. s. lxxiii. 31–40, there were described some novelties found in a highly interesting collection secured by Mrs. Richard C. Curtis of Boston while accompanying a hunting expedition to the interior of Angola and Kenya. Subsequent study of some of the more technical plants of the same series has disclosed the following four species which have not been identified with any as yet described.

Rhynchotropis Curtisiae, sp. nov., herbacea 2–2.5 dm. alta canescens; radice perenni; caulibus pluribus gracilibus laxe ramosis ascendentibus 4-angulatis adpresse pubescentibus; stipulis lanceolatis herbaceis subcaducis acutis 2–5 mm. longis 0.5–1 mm. latis pubescentibus saepe reflexis; foliis 2–3 cm. longis 7–11 mm. latis oblongis vel oblongo-ovatis concoloribus dense adpresse pubescentibus integerrimis alternis apice obtusis vel acutis basi rotundis vel obtusis sessilibus supra enervatis subtus cum nervis prominentibus; racemis axillaribus folia multo superantibus dissitifloris 5–20 cm. longis; bracteis setaceis deciduis 2–3 mm. longis ascendentibus; pedicellis ad anthesin 2–5 mm. longis fructiferis 3–7 mm. longis canescente pubescentibus; calyce 5-laciniato 4–5 mm. longo dense adpresse pubescenti, lobis

subulato-lanceolatis ca. 2.5 mm. longis; corolla rubra; vexillo obtuse quadrangulato 5–6 mm. lato ca. 6 mm. longo glabro; alis ca. 7 mm. longis ca. 3 mm. latis; carina falcata 7–8 mm. longa apice in rostrum rectum producta glabra; staminibus 10 diadelphis alternis brevioribus glabris; antheris orbiculari-oblongis ca. 0.4 mm. longis margine sparse villosulis apice glabratis mucronatis basi cum appendicula scariosa oblonga 0.2–0.3 mm. longa pendula ornatis; stylo glabro falcato; stigmate cymbiformi; leguminibus linearibus 2.5–3.5 cm. longis 1.7–2 mm. latis dense pubescentibus apicem versus uncinato-curvatis.—KENYA: Mau Range, about 70 km. S. W. of Kijabe, July 25, 1923, *Anita G. Curtis 814* (TYPE, Gray Herb.). In consequence of its dilated boat-shaped stigma, rostrate keel, simple leaves, and basally appendaged anthers this species falls into Harms's genus *Rhynchotropis*, Engler's Jahrb. xxx. 86 (1901), a critical group segregated from *Indigofera*. Although I am personally inclined to suspect that the group might better be treated as a subgenus of *Indigofera* I am describing Mrs. Curtis's very distinct species under *Rhynchotropis* because Baker, Jour. Bot. xli. 185 (1903), who studied all the numerous African Indigoferas, has agreed with Harms in excluding the group from *Indigofera*.

From the two other species of the genus, *R. Poggei* of the upper Congo region and *R. Dekindtii* of southern Angola, *R. Curtisiae* differs, in addition to its widely separated range, in its shorter and broader leaves, narrower legumes, and entirely glabrous oblong anther-appendages. Harms, l. c., describes the anthers of the other species as barbellate apically and basally, just as illustrated by Taubert, Pflanzenf. iii. Abt. 3, 260, fig. 115h–k (1894). The apex of the anthers in *R. Curtisiae* has a glabrous mucronate connective quite like that in species of *Indigofera*. The appendages at the base of the anthers in the proposed species are oblong, scarious and entire-margined, and are half to nearly as long as the body of the anther. They are not at all pubescent or lacerate.

Ekebergia pumila, sp. nov., fruticulosa 1–2.5 dm. alta e rhizomate horizontali gracili fruticoso late crasseque squamoso oriens; caulibus simplicibus erectis 5–15 cm. longis paucifoliatis puberulentis; foliis imparipinnatis, rhachi 5–9 cm. longa alata puberulenta basim foliolorum versus inconspicue glandulosa, foliolis firmis 3–4-jugis oppositis lanceolatis 3–5 cm. longis 9–12 mm. latis glabratis integerrimis obscure venosis sessilibus subtus pallidioribus (vel juventate glaucis) supra viridibus apicem versus acute attenuatis basim versus aequaliter attenuatis, terminali oblanceolato acuto 4–5 cm. longo basim versus

valde attenuato; panicula terminali congesta 1–2 cm. diametro pluriflora minute pubescenti; petalis 5 oblongis obtusis 2.5–3 mm. longis extus pubescentibus in alabastro paullo imbricatis; calyce ca. 1.2 mm. alto crassiusculo sparse pubescenti; lobis 5 ovatis acutis ca. 1 mm. altis; tubo stamineo urceolato ca. 1.7 mm. alto extus supra villoso margine dentato (dentibus antheriferis); antheris 10 subexsertis oblongis apiculatis; ovario piloso 2(?)-loculis; stylo glabro; bacca ca. 8 mm. diametro globosa glabra rubescenti monosperma.—ANGOLA: Giant Sable Country, between the Cuanza and Loando rivers, Sept. 20–22, 1923, *Anita G. Curtis 258* (TYPE, Gray Herb.), *237*, *291*.—Readily separable from all the described members of its genus by the presence of alate leaf-rhachises and low stems arising from a horizontal caudex. Its congeners are shrubs or trees.

Lactuca tinctociliata, sp. nov., perennis 3–5.5 dm. alta; caulibus glaberrimis paullo glaucescentibus 1–2 mm. crassis teretibus simplicibus vel supra medium paullo stricte ramosis e radice ca. 12 mm. crasso recto simplici erumpentibus; foliis concoloribus margine purpureo-callosis integerrimis vel dentatis vel subulato-ciliatis costa subtus prominenti saepe purpureo-hispidis, caulinis paucis alternis caulis in partibus inferioribus gestis lanceolato-linearibus sessilibus 4–7 cm. longis 3–4 mm. latis, superioribus gradatim valde reductis, radicalibus lineari-oblanceolatis 5–7 cm. longis 2–7 mm. latis basi in petiolum purpureo-tinctum alatum 1–2 mm. latum attenuatis; inflorescentia saepe cymosa cum bracteis lanceolatis minutis 1–3 mm. longis ornatis paucicapitulatis; capitulis late cylindraceis 12–14 mm. altis 6–7 mm. crassis 1–7 mm. longe pedunculatis; tegulis acutis apicem versus villosulis, exterioribus anguste ovatis vel ovato-lanceolatis inaequalibus ca. 6 ca. 1–6 mm. longis plus minusve recurvatis, interioribus lanceolatis 10–12 mm. longis aequalibus; corollis flavis ca. 12 ca. 13–15 mm. longis, tubo ca. 5 mm. longo albo gracili, lamina oblonga ca. 10 mm. longa ca. 2.5 mm. lata tegulis 5–6 mm. longiori; achaeniis valde compressis oblongo-ovatis vel oblanceolatis 5–6 mm. longis supra in rostrum gracile ca. 1 mm. longum attenuatis basi obscure substipitatis scabridulis, costis ca. 12, marginalibus et centralibus crassioribus; pappi setis albis 5–7 mm. longis antrorse scabridulis.—ANGOLA: Giant Sable Country, between the Cuanza and Loando rivers, Sept. 1923, *Anita G. Curtis 315*, *218*, *283* (TYPE, Gray Herb.).—Very well characterized by its narrow firm purple leaf-margins which commonly bear purplish-tinged teeth and fleshy cilia. I can find no described *Lactuca* that appears to be closely related to the one proposed here.

Lactuca Varianii, sp. nov., glaberrima ca. 4.5 dm. alta perennis; caulibus compluribus erectis herbaceis striatis paullo glaucescentibus ca. 2 mm. crassis aphyllis pauciramosis e radice crassa erecta orientibus; ramis strictis cum bracteis triangularibus brunnescentibus ca. 3 mm. longis suffultis; foliis rosulatis oblanceolatis ca. 6–8 cm. longis ca. 10–12 mm. latis basi attenuatis enervosis ad anthesin deciduis; capitulis numerosis cymosis 5–30 mm. longe pedunculatis anguste cylindraceis 15–18 mm. altis ca. 3–3.5 mm. crassis; tegulis glaberrimis, exterioribus inaequalibus 1–3 mm. longis 1–1.5 mm. latis ovatis acutis 5–7, interioribus aequalibus 5 linearibus obtusis 14–16 mm. longis saepe ca. 1.7 mm. latis margine anguste scariosis in sicco atratis; floribus 10–13 ca. 15–18 mm. longis, tubo gracili 5–6 mm. longo glabro, lamina ca. 2.3 mm. lata valde dentata tegulis ca. 4 mm. longiori; achaeniis compressis anguste lanceolatis 6 mm. longis pallidis ca. 0.8 mm. latis ca. 12-costatis supra in rostrum crassiusculum 1 mm. longum attenuatis antrorse scabridulis stramineis; pappi setis 6–7 mm. longis albis sparse antrorse scabridulis.—ANGOLA: Giant Sable Country, between the Cuanza and Loando rivers, Sept. 20, 1923, *Anita G. Curtis 225* (TYPE, Gray Herb.); Dondé, Bailundo, Sept. 9, 1923, *Anita G. Curtis 167*.—Related to *L. Verdickii* De Wild., Annal. Mus. Congo, Bot., ser. 4, 170, t. 28 (1903), of Katanga, from which it differs in its five tegules, and larger, more attenuate, more abundantly ribbed achenes. The two collections of *L. Varianii* are more erect than the plant of *L. Verdickii* figured by De Wildeman, but otherwise are quite similar in gross habit. Recently R. E. Fries, Acta Hort. Bergiani viii. 113 (1924), transferred *L. Verdickii* to the genus *Sonchus*. The mature achenes of *L. Varianii* are strongly compressed, as much so as those of *L. Verdickii* figured by De Wildeman, and hence the species is launched as a member of *Lactuca*. It is noteworthy, however, that in habit *L. Varianii* seems very similar to the species that Fries, l. c. 92, associates to form the *Sonchus rarifolius*-group.

In accord with a suggestion of Mr. C. P. Curtis this species has been named for Captain H. F. Varian, chief engineer of the Benguella Railroad, to whose hospitality and effective aid the success of the Angola hunting and collecting trip is largely attributed.

IV. SOME UNDESCRIBED AMERICAN SPERMATOPHYTES.

By Ivan M. Johnston.

Acacia Brandegeana, sp. nov., fruticosa 2–3 m. alta; ramis brunneis flexuosis conspicue verrucosis cum spinis rectis brevibus geminatis subulatis armatis juventate pubescentibus; foliis in axibus secondariis brevissimis ad axillas spinorum congestis pubescentibus, petiolis 2–5 mm. longis cum glandula deltoidea concava terminatis, pinnis 1-jugatis 8–12-foliolatis 1–2 cm. longis, foliolis 3–6 mm. longis oblongis coriaceis opacis venosis obtusis sed mucronulatis basi obliquis; spicis cylindricis laxis breviter pedunculatis quam folia saepe longioribus ca. 2.5 cm. longis; calyce paullo inflato ca. 1 mm. longo, lobis deltoideis margine furfuraceis vel hispidis; petalis obovatis obtusis calycem paullo superantibus; staminibus numerosis ca. 2 mm. longis; legumine falcato brunneo canescenti-pubescenti compresso 4–6 mm. lato 4–11 cm. longo striato inter semina plus minusve contracto; seminibus atris oblongis compressis ca. 7 mm. longis 4 mm. latis.—Lower California: a large thorny shrub forming thickets along a wash, Agua Verde Bay, *Johnston 3881* (type, Gray Herb.).—This *Acacia* is widely distributed over the southern half of the peninsula of Lower California and in the past has gone as *A. amentacea* DC. It is most closely related to that species, but differs in its smaller, more numerous, dull, pubescent leaflets, and canescent legumes. It also has a widely separated range. *Acacia amentacea* occurs east of the continental divide in northeastern Mexico, whereas *A. Brandegeana* is endemic to Lower California. In a recent paper, Proc. Calif. Acad. Sci. ser. 4, xii. 1031 (1924), I treated the plant as *A. sonorensis* Rose, but the type of that species proves it to be a very close relative of *A. californica* Brandg. The species is named in honor of the late Townshend Stith Brandegee who made numerous collections of it and suspected its distinctness. I find it a pleasure to associate Mr. Brandegee's name with one more plant of that flora for the knowledge of which he did so much.

Mabea Macbridei, sp. nov., arbuscula; ramulis gracilibus subangularibus olivaceis primo puberulentis mox glaberrimis; foliis oblongis vel elliptico-oblongis 12–18 cm. longis 4.5–6 cm. latis glaberrimis margine leviter crenatis supra nitidis subtus glaucis cum venis conspicuissimis ca. 30 liniatis marginem versus minute glandulosis apice obtusis abrupte acuminatis basi rotundatis vel obtusis eglandulosis; petiolis 9–12 mm. longis; paniculis terminalibus ferruginoso-tomentosis ca. 10 cm. longis 10–12 mm. latis cum bracteis lanceolatis

ornatis, ramulis pistillatis ca. 1 mm. longis unifloris, ramulis staminalibus 1–2 mm. longis umbellatim 2–4-floris ad imam basem inconspicue glandulosis; pedicellis pistillatis ca. 7 mm. longis canescente strigosis; sepalis pistillatis orbicularibus vel acute ovatis canescente pubescentibus ca. 1–1.5 mm. longis eglandulosis; ovario tomentoso inermi; columna stylari 5–7 mm. longa; parte libera stylorum 5–7 mm. longa; pedicellis florum staminalium gracilibus 5–10 mm. longis; calyce staminali ca. 2 mm. lato, lobis ovate deltoideis; staminibus 15–25; antheris fere sessilibus sparse pubescentibus.—PERU: Hacienda Schunke, La Merced, Dept. Junin, 1200 m. alt., *Macbride 5702* (TYPE, Field Mus. no. 536,733).—Probably most related to the Peruvian *M. maynensis* Müll. Arg. from which it differs in its narrow tomentose panicle, shorter staminate peduncles provided with small basal glands, smaller flowers, and row of submarginal glands on the under leaf-surface. The peculiar submarginal row of glands serves to distinguish the plant from all the South American species except *M. nitida* Benth., a species readily separated by its inflorescence, peduncle-glands, etc.

Acalypha Macbridei, sp. nov., fruticosa laxa ca. 9 dm. alta dioeca; ramulis teretibus ca. 3 mm. crassis minute strigosis in partibus junioribus dense canescenter strigosis; foliis firmiter herbaceis glabratis penninervatis late oblanceolatis vel oblongo-lanceolatis 15–23 cm. longis 2.5–5 cm. latis apice attenuato-acuminatis basi obtusis margine inconspicue crenatis supra asperulis subtus subpallidioribus cum venis primariis 15–25 sparse adpresseque villosis prominentibus; petiolis 5–8 mm. longis dense canescenter strigosis; stipulis lanceolatis minutis deciduis ca. 2 mm. longis canescentibus; racemis staminalibus ignotis; racemis pistillatis axillaribus filiformibus 8–16 cm. longis dissitifloris spiciformibus strigosis breviter pedunculatis quam folia brevioribus; bracteis minutis ovato-lanceolatis 1–3-floris; floribus pistillatis vix 1 mm. longe graciliter pedicellatis, sepalis 5 acuti-ovatis glanduloso-denticulatis; ovario dense papilloso; stylo ca. 2.5 mm. longo e basi oblonga divergenter 15–20-laciniato; capsula ignota.—PERU: Pampayacu, hacienda at mouth of Rio Chinchao, Dept. Huanuco, *Macbride 5093* (TYPE, Field Mus. no. 536,144; ISOTYPE, Gray Herb.).—In the recent monograph of *Acalypha* by Pax & Hoffmann, Pflanzenr. iv. Fam. 147, pt. 17 (1924), this species fits into the section *Axillaris* of the subgenus *Terminales*, and is apparently nearest *A. subandina* Uline. From that species, however, it differs in its short petioles, and shorter spicate-racemose rather than paniculate inflorescence.

Acalypha fulva, sp. nov., fruticosa ca. 5 dm. alta; ramulis teretibus satis robustis fulvis cum setis simplicibus glandulosis 2–3 mm. longis villoso-hirsutis; stipulis reflexis lanceolato-subulatis 6–8 mm. longis persistentibus subscariosis glabratis apicem versus glandulosis; foliis ovatis acuminatis serratis 12–36 cm. longis 9–18 cm. latis supra viridibus villosis sparse stipitato-glandulosis inconspicue punctatis subtus pallidioribus in costa nervisque divergenter villoso-hirsutis basi palminerviis profunde cordatis cum auriculis latis valde imbricatis; petiolis 5–15 cm. longis fulvis cum setis glandulosis villoso-hirsutis; spiculis axillaribus androgynis 6–15 cm. longis fulvis glanduloso-pubescentibus 1 cm. supra basem cum bracteis pistillatis 1–2 cordatis ovatisve acutis acuminatisve sessilibus 10–12 mm. longis 11–16 mm. latis unifloris multiplicatis 20–30-dentatis ornatis; sepalis pistillatis oblongo-ovatis glanduloso-ciliatis; ovario dense stipitato-glanduloso et pubescenti; stylis 7–9 mm. longis profunde 10–15-laciniatis.—PERU: Muña, Dept. Huanuco, 2100 m. alt., *Macbride 4011* (TYPE, Field Mus. no. 535,075; ISOTYPE, Gray Herb.).—Belonging to the group *Oligogyne* § *Cuspidatae*, but readily separated from the described members of that section by the gland-tipped pubescence, and deeply cordate leaves with closed sinuses. Mr. Macbride notes that the plant is "pungently resinous."

Sloanea amplifrons, sp. nov., arbor 9 m. alta; ramis crassis angulatis paucis elongatis superne cinnamomeo-tomentellis; foliis alternis amplis subcoriaceis 2–5 dm. longis 1–3 dm. latis ellipticis vel obovatis apice acutis obtusisve basi saepe subcordatis rare rotundis vel obtusis margine sinuato-dentatis subtus pallidioribus et minute puberulentis; petiolo 8–15 cm. longo apice valde incrassato et canaliculato; stipulis persistentibus ascendentibus strictisve irregulariter inciso-dentatis 2–4 cm. longis navicularibus; inflorescentia axillari racemosa 8–15 cm. longa cum bracteis eroso-dentatis 10–15 mm. longis ornata; calyce cyathiformi irregulariter 5–10-dentato extus cinereo-tomentello 4–6 mm. longo 6–10 mm. diametro quarta vel quinta parte dentato 2–3 mm. longe pedicellato; staminibus calycem superantibus; filamentis perbrevibus; antheris tetragonis pilosis obtusis libris; pistillo staminibus ½–2-plo longiore; ovario 4-loculari densissime villoso in stylum simplicem pilosum continuo; capsula globosa uniloculari monosperma ca. 15 mm. diametro cum setis gracilibus scabris curvatis numerosissimis 20–35 mm. longis ornata; fructu (i. e. capsula cum setis) 4.5–5.5 cm. diametro spongioso.—CAYENNE: without locality, *Martius* (G). SURINAM: without locality, *Hostmann 1025* (G). BRITISH GUIANA: Kartabo Region, *Bailey 37* (G); Koreai Creek, *Linder 158* (TYPE,

Gray Herb.); Anabisi River, Northwest District, *La Cruz 1364* (NY); Waroowaro Creek, Pomeroom River, *Jenman 7787* (NY). VENEZUELA: Eleanor Creek, lower Orinoco, *Rusby & Squires 260* (G, NY).—The plant here described in the main appears to be the *Sloanea dentata* of the Flora Brasiliensis, xii, pt. 3, 178, t. 37 (1886). As Urban, Fedde Repert. xv. 321 (1918), has pointed out, *S. dentata* L. is strictly West Indian being based on a Plukenet specimen probably from Martinique. A study of the matter seems further to indicate that *S. dentata* L. has a synonym in *S. Massoni* Sw., and that the Linnean name should apply to the concept treated as *S. Massoni* in the Flora Brasiliensis. There can be no doubt that the South American plant described here as *S. amplifrons* is distinct from the West Indian *S. dentata* L. Among its group of immediate relatives, those with broad leaves and persistent stipules, it is readily recognized by its fruit and cyathiform calyx. The capsule is covered with exceedingly numerous, long, very slender, antrorsely scabrous and tortuous appendages. These are flexuous near their tips and more or less intertangled to form a spongy mass. The related species all have relatively few, straight, coarser, glabrous capsule-appendages, and parted calyces. According to Professor I. W. Bailey the plant is a myrmecophyte, ants using as dometia the large boat-shaped stipules which are strictly appressed to the stem.

Fouquieria Digueti (Van Tieghem), comb. nov. *Bronnia Digueti* Van Tieghem, Jour. de Bot. xiii. 297 (1899). *B. Thiebauti* Van Tieghem, l. c. *F. peninsularis* Nash, Bull. Torr. Bot. Cl. xxx. 455. (1903); Johnston, Proc. Calif. Acad. ser. 4, xii. 1099 (1924).—There can be no doubt that Van Tieghem's two species are synonymous with each other and with the later *F. peninsularis* of Nash.

Fuchsia perbrevis, sp. nov., glabrata; foliis oppositis ovatis vel elliptico-oblongis 4–10 cm. longis 2.5–3.5 cm. latis apicem et basim versus attenuatis margine evidenter dentatis supra brunneis glaberrimis subtus pallidioribus cum costa et nervis brunnescentibus puberulentis prominentibus; petiolis 2–6 mm. longis; stipulis firmis subpersistentibus triangularibus 1–2 mm. altis; floribus coccineis axillaribus paucis; ovario glaberrimo 10–12 mm. longo angulato oblongo-cylindrico ca. 2 mm. crasso basim versus in pedicellum 1–1.8 cm. longum nutantem crassiusculum attenuato supra vix attenuato; hypanthio 3–4(–5) mm. longo basim versus 2–2.5 mm. crasso apicem versus 3.5–5 mm. crasso intus et extus glaberrimo gradatim ampliato; sepalis ca. 1 cm. longis oblongis vel oblongo-lanceolatis acutis vel attenuatis ascendentibus basim versus 2–3 mm. latis, alternis angus-

tioribus (?); petalis oblongis ca. 1 cm. longis ca. 4 mm. latis paullo asymmetricis apice rotundis; staminibus 8 inaequalibus; antheris ovatis ca. 2 mm. longis; filamentis 1 et 3 mm. longis glabris; stylo 7–8 mm. longo glaberrimo apicem subintegro; bacca capsulari angulata ca. 15 mm. longa ca. 4 mm. crassa.—COLOMBIA: Ultra Abate, *Holton 892* (TYPE, N. Y. Bot. Gard.); Barroblanco, *André 1336* (NY).—A species remarkable because of its very abbreviated broad hypanthium and angular capsular fruit. Both specimens appear to have been obtained to the east of Bogotá. The clean brownish cast of the dried foliage is unique, as is also the very long and angulate ovary. At first glance the latter is readily mistaken for the hypanthium, that being very short and broader than long.

Fuchsia Andrei, sp. nov., fruticans glabrata; ramulis fistulosis apicem versus minute pubescentibus mox glaberrimis nitidis laevigatis 4–8 mm. crassis; foliis oppositis vel ternatis oblongis vel obovato-oblongis 7–16 cm. longis 3–6.5(–9) cm. latis margine integerrimis minute sparseque ciliolatis apice abrupte acuminatis basi obtusis vel acutis supra viridibus glaberrimis subtus pallidioribus in nervis prominentibus sparse inconspicue villosulis; petiolis 1–2.5 cm. longis glabratis; stipulis caducis obliquis deltoideis ca. 1 mm. altis; inflorescentia breviter racemosa parvibracteata; bracteis lanceolatis 3–9 mm. longis quam pedicelli graciles 10–15 mm. longi multo brevioribus; ovario oblongo glabrato ca. 5 mm. longo ca. 2–2.5 mm. crasso; hypanthio 2–3 cm. longo basi subnodoso supra medium apicem versus gradatim ampliato 4–4.5 mm. crasso extus glaberrimo intus infra medium piloso; sepalis oblongo-lanceolatis acutis 6–9 mm. longis ascendentibus; petalis lineari-oblongis ca. 10 mm. longis ca. 3 mm. latis obtusis quam sepala vix longioribus; staminibus 8 inaequalibus glabris gracilibus; stylo infra medium piloso cum stigmate 4-lobato coronato; bacca 5–6 mm. longa.—COLOMBIA: Rio de Huannamaca, 1876, *André K. 820* (TYPE, Field Mus. no. 537,131; ISOTYPE, NY); Tambo de Savanilla, 1877, *André K. 818* (G, NY, FM).—In a very general way suggesting *F. scabriuscula* Benth., an Ecuadorian species, but quite different in its terminally racemose flowers and glabrous foliage. Under a lens the surface of the leaves appears to be minutely and closely pebbled.

Fuchsia atrorubra, sp. nov., fruticans; ramulis subteretibus strigulosis; foliis herbaceis ternatis obovatis vel obovato-ellipticis 4–12 cm. longis 2.5–5 cm. latis inconspicue denticulatis apice acutis basim versus in petiolum 6–20 mm. longum attenuatis supra glabratis puberulentisve subtus pallidioribus in venis dense strigosis; stipulis

deltoideis glabris crassis subpersistentibus ca. 1–1.5 mm. altis; floribus in axilla terminali vel subterminali orientibus in racemos foliosos 1–3 cm. longos cernuos aggregatis; pedicellis 5–8 mm. longis densissime canescente strigosis; ovario ellipsoideo 4–5 mm. longo; hypanthio 13–15 mm. longo gracili basi vix nodoso apicem versus gradatim minime dilatato 2–2.5 mm. crasso in sicco purpureo-rubro extus dense striguloso intus dense villosulo; sepalis lineari-lanceolatis 6–8 mm. longis 1–1.5 mm. latis; petalis lanceolato-oblongis acutis 6–7 mm. longis 1.5–2 mm. latis in sicco roseo-purpureis; staminibus 8 inaequalibus inclusis; antheris oblongis; stylo pubescenti; bacca elliptica 13–14 mm. longa 5–6 mm. crassa.—COLOMBIA: along stream, "Santa Elena" above Santuario, Dept. Caldas, 2000–2300 m. alt., *Pennell 10313* (TYPE, Gray Herb.); wet forested cliff, Rio Santa Rita, Salento, Dept. Caldas, 1600–1800 m. alt., *Killip & Hazen 8966* (G); roadside thickets, Salento, Dept. Caldas, 1700–1900 m. alt., *Pennell & Hazen 10144* (G).—A species characterized by its very small, dark, terminal, more or less racemose flowers. *Fuchsia Hartwegi* Benth., *F. sessiliflora* Benth., and *F. verrucosa* Benth. are the only small-flowered members of the genus described from northwest South America. The two former have bright-colored flowers in racemose panicles, and the last has very short petioles and a restricted rough pubescence.

Fuchsia glaberrima, sp. nov., macrophylla frutescens; foliis firmis late oblanceolatis 10–20 cm. longis 4–8 cm. latis integerrimis oppositis acutis basim versus attenuatis saepe purpureo-tinctis subsessilibus vel brevissime (2–5 mm. longe) petiolatis; stipulis persistentibus firmis connatis reflexis, jugis connatis latissime triangularibus 2–2.5 mm. altis 4–5 mm. latis; floribus in racemum parvifoliate bracteatum terminalem aggregatis coccineis ca. 7 mm. longe pedicellatis; ovario fusiformi 8–9 mm. longo 1.5–2 mm. crasso; hypanthio 2.5–3 cm. longo basi nodoso deinde subcontracto apicem versus gradatim ampliato 5–6 mm. crasso extus glaberrimo intus dense pubescenti; sepalis oblongis 9–11 mm. longis ca. 4.5 mm. latis; petalis ca. 9 mm. longis late obovatis quam sepala brevioribus apice rotundatis; staminibus inaequalibus 8 inclusis; filamentis pro genere brevibus; antheris oblongis; stylo dense pubescenti cum stigmate leviter lobato coronato.—ECUADOR: Valley of Pastaza River, between Baños and Cashurco, 8 hours east of Baños, Prov. of Tungurahua, 1300–1800 m. alt., *Hitchcock 21750* (TYPE, Gray Herb.).—Evidently an ally of *F. spectabilis* Hook., agreeing with it in being practically glabrous, and especially in its peculiar stipules. The stipules of the opposite leaves

are confluent to form a single coarse broad persistent reflexed stipular appendage on each side of the stem. *Fuchsia glaberrima* differs from *F. spectabilis* in its smaller flowers borne in a terminal cluster rather than solitary in the axils of the main leaves, in its densely pubescent rather than very sparsely villous inner surface of the hypanthium, and in its entire (not ciliate-margined) leaves.

Fuchsia Hitchcockii, sp. nov., fruticans foliosa pubescens; foliis ternatis firmis ellipticis vel elliptico-obovatis 3–6 cm. longis 1.5–2.2 cm. latis remote denticulatis 5–15 mm. longe petiolatis apice acutis basim versus (rare inaequaliter) attenuatis supra sparsissime puberulentis in sicco atris subtus pallidioribus sparse canescenter villosis; stipulis subulatis deciduis ca. 2 mm. longis inconspicuis; floribus coccineis axillaribus 2–5 cm. longe pedicellatis; ovario obovato-elliptico 3–4 mm. longo breviter villoso; hypanthio 5–6 cm. longo basi nodoso deinde paullo constricto apicem versus gradatim ampliato 5–6 mm. crasso extus sparsissime villoso intus velutino-pubescenti; sepalis lanceolatis longe acuminatis 18–22 mm. longis 4–5 mm. latis; petalis orbiculari-obovatis 10–12 mm. longis apice rotundatis; staminibus 8 inaequalibus quam petala brevioribus longioribusve; antheris oblongis; stylo pubescenti stigmate globoso subintegro exserto coronato.—ECUADOR: between Oña and Cuenca, Prov. of Azuay, 2700–3300 m. alt., *Hitchcock 21603* (TYPE, Gray Herb.).—An interesting species with medium-sized pubescent ternate leaves and very slender elongate axillary flowers. The narrow sepals nearly twice exceed the broadly obovate rounded petals. It is apparently most related to *F. ayavacensis* HBK., but differs in its more elongate hypanthium, narrow and longer sepals, pubescent style, and more coarsely pubescent stems and leaves.

Fuchsia Townsendii, sp. nov., fruticosa foliosa canescens; foliis ternatis oblanceolatis 6–12 cm. longis 22–30 mm. latis firmis margine remote denticulatis paullo revolutis apicem versus in acumen curvatum attenuatis basim versus in petiolum 5–20 mm. longum pubescentem gradatim contractis supra viridibus inconspicue sparseque villosulis subtus pallidioribus cum nervis prominentibus infra medium dense breviter canescenti-villosis; stipulis subulatis caducis 1–2 mm. longis; floribus axillaribus paucis coccineis; pedicellis gracilibus ascendentibus pubescentibus 15–25 mm. longis; ovario anguste ellipsoideo ca. 9 mm. longo breviter villoso; hypanthio 5–5.5 cm. longo basi nodoso deinde contracto deinde graciliter tubuloso apicem versus gradatim ampliato 5–6 mm. crasso extus puberulento intus infra medium dense canescenti-pubescenti; sepalis 10–12 mm. longis

ascendentibus lanceolatis acutis basi ca. 4 mm. latis; petalis ovatis 9–10 mm. longis ca. 8 mm. latis apice rotundis vel obtusis quam sepala paullo brevioribus; staminibus 8 inaequalibus glabris pubescentibus; stylo infra medium pubescenti cum stigmate globoso subintegro ornato.—ECUADOR: Sabiango Hill, Nov. 26, 1910, *C. H. T. Townsend A93* (TYPE, U. S. Nat. Herb. no. 534,349).—Related to *F. Hitchcockii*, from which it differs in its larger more attenuate leaves, shorter softer as well as denser pubescence, and shorter sepals.

Fuchsia apiculata, sp. nov., frutex; ramulis molliter pubescentibus; foliis firmis oblongis vel elliptico-oblongis 2.5–6 cm. longis 12–20 mm. latis remote denticulatis acutis saepe ternatis 1–3 cm. longe petiolatis subtus pallidioribus infra medium costam versus evidenter canescenti-villosis; stipulis subulatis inconspicuis deciduis 1–2 mm. longis; floribus axillaribus saepe 1–2 cm. longe pedicellatis coccineis pendulis; ovario pubescenti elliptico 3–4 mm. longo; hypanthio 20–25 mm. longo basi fusco et nodoso deinde subconstricto apicem versus gradatim ampliato 5–6 mm. crasso extus glabrato intus infra medium dense canescenti-pubescenti; sepalis ovato-oblongis 8–9 mm. longis acutis evidenter apiculatis; petalis ovatis ca. 6–7 mm. longis ca. 5 mm. latis late breviterque unguiculatis apice obtusis; staminibus 8 inaequalibus glaberrimis inclusis; antheris breviter oblongis; stylo infra medium canescente pubescenti aliter glabro stigmate globoso subintegro coronato.—ECUADOR: Between Cuenca and Huigra, Prov. of Azuay, and Cañar, 2700–3000 m. alt., *Hitchcock 21667* (TYPE, Gray Herb.).—In general habit somewhat suggesting *F. decussata* R. & P. of Peru, but differing in color of pubescence, obovate petals, and densely pubescent inner surface of the hypanthium.

Fuchsia spectabilis Hook., var. **pubens**, var. nov., in foliis et hypanthiis dense molliter pubescens.—ECUADOR: vicinity of Huigra, *Rose & Rose 22479* (TYPE, U. S. Nat. Herb. no. 1,022,130).—Differing from the typical form in its minute soft pubescence—an indument so soft and fine that the foliage feels waxy to the touch. I am unable to detect any difference between the description of *F. longiflora* Benth., Pl. Hartweg. 177 (1845), and plants referable to *F. spectabilis* Hook., Bot. Mag. lxxiv. t. 4375 (1848), but am using the latter name since I know positively that it applies to the concept in mind and because it seems unlikely that Hooker, who had Bentham's types available, would have proposed his species had it been quite like the earlier.

Fuchsia hypoleuca, sp. nov., fruticans foliosa pubescens; foliis firmis ternatis late lanceolatis 3–7.5 cm. longis 1–1.7 cm. latis apicem

et basim versus acutis margine saepe paullo revolutis remote denticulatis supra viridibus inconspicue sparseque hispidulis subtus pallidis hispidis cum nervis prominentibus; petiolis 5–10 mm. longis dense pubescentibus; stipulis setaceis caducis erectis 2–3 mm. longis; floribus axillaribus pendulis coccineis vix numerosis; ovario elliptico ca. 4 mm. longo strigoso; hypanthio 18–23 mm. longo basi bulboso deinde contracto apicem versus gradatim ampliato 4(–6) mm. crasso extus puberulento intus infra medium dense villoso; sepalis lanceolatis 8–12 mm. longis ascendentibus basi ca. 2.5 mm. latis; petalis obovatis ca. 7 mm. longis 4–5 mm. latis quam sepala 2–4 mm. brevioribus apice rotundis; staminibus 8 inclusis inaequalibus glabris; stylo basim versus villoso cum stigmate subintegro coronato.—ECUADOR: between Loja and San Lucas, Prov. Loja, 2100–2600 m. alt., *Hitchcock 21440* (TYPE, Gray Herb.): "southern provinces," *W. Jameson* (US).—Most related to *F. scabriuscula* Benth., from which it differs in its narrow ternate leaves and canescent rather than brownish pubescence. Both of the cited specimens usually have the paleness of the under leaf-surfaces intensified by a fine dense covering of fungus mycelium.

Fuchsia macrophylla, sp. nov., fruticosa laxe ramosa 15 dm. alta; caulibus fistulosis 4–6 mm. crassis griseis partibus junioribus puberulentis ceteris glabratis; foliis herbaceis oppositis puberulentis ellipticis vel lato-oblanceolatis in petiolum 2–4 cm. longum gradatim contractis 10–27 (saepe ca. 16) cm. longis 2.5–7 (saepe ca. 5.5) cm. latis apice grosse acuminatis margine integerrimis paullo undulatis; stipulis filiformibus deciduis ca. 2 mm. longis; floribus coccineis; corymbulis laxis paucifloris foliaceo-bracteatis ex axillis superioribus orientibus; pedicellis gracilibus erectis divaricatisve 1–2 cm. longis; ovario ellipsoideo puberulento ca. 5 mm. longo; hypanthio ca. 23 mm. longo basi nodoso deinde contracto apicem versus gradatim ampliato 4–5 mm. crasso extus puberulento mucronato (mucro viridescenti); petalis oblanceolato-obovatis ca. 9–10 mm. longis apice rotundatis mucronatis sepala paullo superantibus; staminibus 8 inaequalibus quam petala paullo brevioribus; antheris oblongis; stylo villoso stigmate subintegro coronato.—PERU: along streams, Hacienda Schunke, La Merced, Dept. Junin, 1200 m. alt., *Macbride 5616* (TYPE, Field Mus. no. 536,655; ISOTYPE, Gray Herb.).—Well marked by its small flowers and large thin leaves tapering at both ends. To judge from descriptions it seems related to *F. asperifolia* Krause, but differs in being puberulent rather than hirsute, and in having a different inflorescence. Although the flowers of *F. macrophylla* appear to be borne in small leafy pedunculate corymbs produced along the upper parts of the

branches, they are in fact solitary in the axils on leafy branchlets only 2–3 cm. long.

Fuchsia velutina, sp. nov., scandens canescente velutina; foliis oppositis ellipticis firmis 6–11 cm. longis 3–5 cm. latis integerrimis vel inconspicue denticulatis dense minute canescente velutinis apice breviter acuminatis basim versus paullo attenuatis superioribus vix reductis in venis et costa purpureo-tinctis; petiolis 6–15 mm. longis; floribus terminalibus in racemum brevibracteatum brevipedunculatum pauciflorum dispositis; pedicellis 6–10 mm. longis; ovario ellipsoideo ca. 5 mm. longo inconspicue velutino; hypanthio 5–6 cm. longo basi bulboso deinde sensim contracto, 2–3 cm. supra basim gradatim ampliato deinde cylindrico vel ca. 2 cm. supra basim ad summum gradatim ampliato ca. 5 mm. crasso extus puberulento intus sparse pubescenti; sepalis lineari-lanceolatis 13–15 mm. longis acutis; petalis linearibus 14–17 mm. longis ca. 3 mm. latis acutis; staminibus 8 inaequalibus inclusis glabris; stylo pubescenti stigmate globoso subintegro coronato; bacca ignota.—PERU: Yanano, ca. 1800 m. alt. *Macbride 3715* (TYPE, Field Mus. no. 534,777; ISOTYPE, Gray Herb.).—A species well-marked by its firm canescent-velvety leaves and few-flowered terminal racemes of elongate slender flowers. In habit *F. velutina* suggests *F. miniata* Planch. & Lind., a Colombian species, but differs in its pubescence and consistently opposite leaves.

Fuchsia polyanthella, sp. nov., scandens; ramis ca. 4 mm. crassis partibus junioribus sparse hispidulosis; foliis oppositis 10–15 cm. longis 5–7 cm. latis firmiter membranaceis ellipticis hispidulostrigosis apice breviter acuminatis basin versus in petiolum hispidulum 2–5 cm. longum attenuatis subtus pallidioribus margine integris vel inconspicue denticulatis ciliolatis; stipulis cuneato-lanceolatis glabris 2–4 mm. longis tarde deciduis; floribus coccineis graciliter (ca. 12–15 mm. longe) pedicellatis in racemum ca. 1 cm. longe lanceolatobracteatum axillarem 1–5 cm. longum 2–5 cm. longe pedunculatum aggregatis; racemis omnibus in paniculam laxam terminalem decidue foliolosam 1–4 dm. longam dispositis; ovario ellipsoideo glaberrimo 5–6 mm. longo; hypanthio ca. 15 mm. longo basi nodoso deinde subconstricto apicem versus paullo ampliato 3–4 mm. crasso extus glaberrimo intus infra medium villoso; sepalis lanceolatis acutis ascendentibus 10–12 cm. longis; petalis obovato-oblongis ca. 8 mm. longis obtusis quam sepala paullo brevioribus; staminibus 8 inaequalibus quam petala brevioribus; antheris oblongis; stylo glabro stigmate globoso leviter quadrifido coronato; bacca ca. 1 cm. longa.—PERU: Muña, on trail to Tambo de Vaca, Dept. Huanuco, 2400 m. alt., *Macbride 4290*

(TYPE, Field Mus. no. 535,372; ISOTYPE, Gray Herb.).—Characterized by its rather large bicolored strigose leaves and open terminal panicles formed of pedunculate short small-bracted racemes developing from the upper leaf-axils. Although coming from Muña, the source of most of the Fuchsias described by Ruiz & Pavon, it is quite different from any of those species. Among the species known from Muña *F. polyanthella* most suggests *F. oratis* R. & P., but is quite different in its much smaller externally glabrous flowers, quite different inflorescence, and more slender glabrate stems.

Fuchsia abrupta, sp. nov., frutex scandens; ramis divaricatis glabris ca. 5 mm. crassis; foliis subcoriaceis oppositis lanceolatis vel oblanceolatis 8–12 cm. longis 2.5–4 cm. latis integerrimis 4–8 mm. longe petiolatis apice acuminatis basi angustis supra glabris (in sicco) fuscis subtus pallidis conspicue paralleliterque nervatis villoso-puberulentis, eis inflorescentiarum abrupte multo reductis; stipulis filiformi-subulatis deciduis ca. 3 mm. longis; floribus terminalibus in racemum 1–2 dm. longum bracteatum pendulum dispositis coccineis 2.5–4 cm. longe pedicellatis; ovario elliptico ca. 7 mm. longo glabro; hypanthio 3.5–4.5 cm. longo basi nodoso deinde contracto apicem versus cylindrico vel saepe paullo gradatim ampliato 4–5 mm. crasso extus glabro intus basim versus villoso; sepalis lanceolatis 13–15 mm. longis acutis; petalis oblongis apice obtusis mucronatis sepalis subaequalibus ca. 14–15 mm. longis; staminibus 8 inaequalibus quam petala brevioribus; antheris oblongis; stylo basim versus villoso stigmate globoso leviter quadrifido coronato; bacca cylindrica 13 mm. longa ca. 4 mm. crassa. —PERU: along river, Cushi, Dept. Huanuco, 1500 m. alt., *Macbride 4541* (TYPE, Field Mus. no. 535,618; ISOTYPE, Gray Herb.).—Well marked by its elongate bicolored leaves that are suddenly reduced in the terminal racemose inflorescence.

FUCHSIA BOLIVIANA Carr. Rev. Hort. xlviii. 150 cum tab. (1876).—BOLIVIA: vicinity of Sorata, *Mandon 622* (G); near Yungas, 1200 m. alt., *Rusby 1071* (G, US); Yungas, *Bang 327* (G, US); without locality, *Bang 1806* (G, US), *Bang 2833* (G, US), *Holway 643* (US). PERU: Ollantaytambo, 3000 m. alt., *Cook & Gilbert 290* and *443* (US); San Miguel, Urubamba Valley, 1800 m. alt., *Cook & Gilbert 915* (US); Tambo, Dept. of Ayacucho, 3100–3200 m. alt., *Weberbauer 5555* (FM).—The above named species which was clearly described and beautifully illustrated by Carrière is the one from Bolivia and southern Peru which has usually passed for *F. corymbiflora* R. & P. A study of Ruiz & Pavon's description and plate, Fl. Peruv. iii. 87, t. 325 (1802), makes it clear that *F. boliviana* and *F. corymbiflora* are quite

distinct, the latter having a much broader more inflated hypanthium that is densely pubescent outside and glabrous within, obtuse buds, and a comparatively small inflorescence rather than a large drooping one. The corollas of *F. boliviana* are merely puberulent outside, but within are densely pubescent below the middle, and the hypanthium is only very gradually dilated, being very slender and almost tubular. The buds are apiculate. The stems of the plant are usually abruptly terminated, above a certain point producing only several strongly drooping or pendent corymbose racemes and only a few reduced leaves. In northwestern South America *F. boliviana* is represented by the following variety.

Fuchsia boliviana, var. **luxurians**, var. nov., splendens; hypanthio 5–6 (non 3–4) cm. longo.—JAMAICA: vicinity of St. Helens Gap, St. Andrew, 1475 m. alt., *Maxon & Killip 571* (G). VENEZUELA: Colonia Tovar, *Pittier 9252* (TYPE, Gray Herb.), *Jahn 439* (US). COLOMBIA: "Las Minitas," south of Caldas, *Pennell 10970* (G).—This variety is the plant most common under the name of *F. corymbiflora* R. & P., and that well illustrated in the Botanical Register, xxvi. t. 70 (1840), and the Botanical Magazine, lxix. t. 4000 (1843). It differs from typical *F. boliviana* in its larger (albeit similarly proportioned) flowers and better developed longer racemes. It appears to be only a more luxuriant northern variant of this species.

Fuchsia Steinbachii, sp. nov., fruticans apetala; ramis 2–3 cm. crassis glabris brunnescentibus cortice plus minusve deciduo; foliis herbaceis oppositis ovato-oblongis 4–8 cm. longis 1.5–3.5 cm. latis sparse puberulentis supra (in sicco) fuscis subtus pallidioribus et evidenter nervatis margine integris vel inconspicue denticulatis apice acutis vel acuminatis basim versus in petiolum 8–12 mm. longum contractis; stipulis deciduis inconspicuis subulatis ca. 1 mm. longis; floribus in racemum parvifoliate bracteatum terminalem aggregatis carneis 1.5–3(–4) cm. longe pedicellatis; ovario fusiformi 6–8 mm. longo 2–2.5 mm. crasso glabro; hypanthio 4–5 cm. longo basi nodoso deinde subcontracto apicem versus gradatim ampliato 5–6 mm. diametro extus glaberrimo intus omnino vel saltem infra medium conspicue pubescentibus; sepalis anguste lanceolatis ca. 2 mm. longis ca. 4 mm. latis ascendentibus acuminatis; petalis nullis; staminibus 8 inaequalibus glaberrimis inclusis vel extrusis; antheris oblongis; stylo infra medium canescente pubescenti; stigmate oblongo-globoso; bacca ca. 9 mm. crassa.—BOLIVIA: open woods, Incachaca, Dept. of Cochabamba, 2500 m. alt., *Steinbach 5038* (TYPE, N. Y. Bot. Gard.); without locality, *Kuntze* (NY).—This species belongs to the group of

F. membranacea Hemsl., Jour. Bot. xiv. 70 (1876), and is apparently most related to *F. juntasensis* Kuntze from which it differs in its larger, longer-petiolate leaves, much larger calyx-lobes and strongly unequal stamens.

Fuchsia furfuracea, sp. nov., fruticans; ramulis sparse villoso-hirsutis; foliis oppositis firmis oblongis 7–9 cm. longis 2.5–4 cm. latis evidenter denticulatis dense minute furfuraceis opacis apicem versus in acumen grossum curvatum attenuatis basi saepe obtusis 8–20 mm. longe petiolatis, supra breviter hirsuto-strigosis, subtus strigosis pallidioribus juventate dense villoso-tomentosis; stipulis lanceolatis 2–3 mm. longis acuminatis herbaceis deciduis; floribus coccineis in racemum terminalem parvibracteatum erectum congestis; pedicellis 2–4 cm. longis conspicue pubescentibus; ovario elliptico ca. 8 mm. longo dense villoso; hypanthio 3.5–4.5 cm. longo basi nodoso deinde constricto medium versus ampliato deinde cylindrico et ca. 7 mm. crasso extus plus minusve hispido-villoso intus villoso; sepalis lanceolatis attenuatis 15–20 mm. longis in alabastro apicibus liberis ca. 2 mm. longis; petalis ovatis ca. 9 mm. longis apice obtusis; staminibus 8 inaequalibus glabris; antheris oblongis; stylo retrorso-villoso stigmate leviter lobato coronato.—BOLIVIA: Unduavi, 3000 m. alt., *Rusby 2511* (NY); Yungas, *Bang 674* (TYPE, Gray Herb., ISOTYPE, US, NY).—A well defined species with opaque minutely furfuraceous-pubescent leaves, and large terminal racemose flowers. From *F. peruviana* Carr., the only other petaliferous Bolivian species with definitely terminal inflorescence, it differs in the shape of the buds, their free tips, and the longer-petioled furfuraceous leaves. The plant much suggests the original plate of *F. corymbiflora* R. & P., Fl. Peruv. iii. t. 325 (1802), but differs in its longer pedicels, pubescent inner surface of the hypanthium, and less pubescent more acuminate leaves.

Fuchsia Brittonii, nom. nov. *F. boliviana* Britt. Bull. Torr. Bot. Cl. xvii. 214 (1890); not *F. boliviana* Carr. (1876).—BOLIVIA: vicinity of Ananca, 2900 m. alt., *Mandon 624* (G); Yungas, *Bang 675* (G); PERU: San Miguel, Urubamba Valley, 1800 m. alt., *Cook & Gilbert 1110* (G).

Gilia inyoensis, sp. nov., herba annua humilis a basi laxe ramosa 5–10 cm. alta; caulibus gracilibus dichotomis rubescentibus basim versus villosis aliter glabratis sparse sed evidenter stipitato-glandulosis; foliis basalibus evanescentibus laxe rosulatis 8–12 mm. longis ca. 2.5 mm. latis sparse villosis crassis late affixis oblanceolatis acutis et mucronatis; foliis caulinis sparsis alternis recurvatis saepe villosis oblongis vel oblongo-lanceolatis rariter pauci-lobatis 3–8 mm. longis

1–2 mm. latis; floribus axillaribus sparsis superioribus in corymbum pauciflorum aggregatis; pedicellis gracilibus saepe ascendentibus 8–16 mm. longis sparse stipitato-glandulosis; sepalis lanceolatis acutis 2–3 mm. longis evidenter scarioso- et albo-marginatis sparse glandulosis; corolla 5–6 mm. longa 6–10 mm. diametro glabra, tubo brevi 2–2.5 mm. longo paullo ampliato ca. 2 mm. diametro aurantiaco-brunnescentibus, lobis ascendentibus albis (in sicco dilute aurantiaco-tinctis) obovatis obtusis vel plus minusve retusis rariter paullo inconspicueque cuspidatis; filamentis glabris 2 mm. longis albis infra medium tubum affixis; ovario elliptico brunneo; capsula ignota.—CALIFORNIA: in coarse granite sand in the foothills west of Bishop, Inyo County. *Heller 8281* (TYPE, Gray Herb.).—Although it has been confused with *G. campanulata* Gray, which in fact is its immediate relative, *G. inyoensis* is readily separable by its reddish stems, small subentire leaves and very differently proportioned corolla. The proposed species has a broadly funnelformed corolla with a tube shorter than the corolla-lobes and sepals, and not one which is clearly campanulate nor has a well developed tube longer than either corolla-lobes or sepals.

V. STUDIES IN THE BORAGINACEAE.—V.

BY IVAN M. JOHNSTON.

1. CONCERNING THE RANGE AND IDENTITY OF CERTAIN AMERICAN SPECIES.

Lithospermum cinerascens (A. DC.), comb. nov. *Macromeria cinerascens* A. DC. Prodr. x. 69 (1846); Johnston, Contr. Gray Herb. n. s. lxx. 15 (1924).—A collection made by Macbride & Featherstone (no. 1185) at Yanahuauca, Peru, agrees closely with De Candolle's description of *M. cinerascens* and with a photograph of the type kindly supplied me by Dr. H. M. Hall. The plant is clearly a species of *Lithospermum*, probably most related to *L. mediale* Johnston, and in my recent synopsis of the genus, l. c., keys out with the Mexican *L. calycosum* (Macbr.) Johnston.

LITHOSPERMUM DISTICHUM Ortega, Hort. Matr. Dec. i. 8 (1797); Johnston, Contr. Gray Herb. n. s. lxx. 24 (1924). *Myosotis grandiflora* HBK. Nov. Gen. et Sp. iii. 90, t. 199 (1818); A. DC. Prodr. x. 114 (1846); Johnston, l. c. 55.—It seems clear that the troublesome name, *Myosotis grandiflora* HBK., belongs in the synonymy of *L. distichum*. The type of *M. grandiflora* was examined by Gray in 1887, the year

before his death. I find among his notes, made on the Bonpland herbarium at Paris, that the original material of *M. grandiflora* came from Real del Monte, Mexico, rather than from Eucador as published, and that Gray thought it represented a white-flowered member of *Lithospermum* § *Batschia*. With these clews as to the real source of the type specimens and the probable relationship of the plant, it is readily seen from an examination of Kunth's description and plate that *M. grandiflora* is a rather large-flowered phase of *L. distichum*, the common white-flowered species of southern Mexico.

LITHOSPERMUM LASIOSIPHON Johnston, Contr. Gray Herb. n. s. lxx. 22 (1924).—This species, described from the Sierra Madre of middle Chihuahua, can now be reported from the "State of Durango" there being a specimen from that region in the National Herbarium collected by P. Ibana Garcia (no. 394). The Durango material differs from the type in its lack of persistent basal leaves and in having the lower leaf-surfaces not noticeably glaucescent.

LITHOSPERMUM MULTIFLORUM Torr. in Gray, Proc. Am. Acad. x. 51 (1874).—This species has a clear synonym in *L. arizonicum* Gandoger, Bull. Soc. Bot. France lxv. 62 (1918), a species based upon *MacDougal 242* from Flagstaff, Arizona. The corolla of this as well as numerous other American lithosperms has been described and figured in an excellent paper by Spengler, Oesterr. Bot. Zeitschr. lxviii. 109 (1919). This useful paper was overlooked by me during the preparation of my synopsis of *Lithospermum* as were also Bessey's paper, Am. Nat. xiv. 417–421 (1880), on "The supposed dimorphism in Lithospermum longiflorum," and Smith's, Bot. Gaz. iv. 168 (1879), on "Trimorphism in Lithospermum canescens."

LASIARRHENUM STRIGOSUM (HBK.) Johnston, Contr. Gray Herb. n. s. lxx. 15 (1924). *Onosmodium eriocaulon* A. DC. Prodr. x. 70 (1846); Johnston, l. c. 55.—Through the kindness of Dr. H. M. Hall I have seen a photograph of the type of *Onosmodium eriocaulon*. A study of this photograph has convinced me that De Candolle's species is the same as *Lasiarrhenum strigosum*. The type is in fruit only, but has the coarse shaggy stem-pubescence and narrow leaves characteristic of *L. strigosum*. It was collected by Berlandier in the Cordillera de Guchilaque. This locality has not been precisely located but from data given by Lasègue, Notices Mus. Bot. Delessert 207 (1845), it appears to be in western Morelos or in the southern part of the state of Mexico and hence just within the known range of *L. strigosum*.

ANTIPHYTUM FLORIBUNDUM (Torr.) Gray, Proc. Am. Acad. x. 55

(1874). *Amsinckia mexicana* Mart. & Gal. Bull. Acad. Brux. xi. 339 (1844); not *Antiphytum mexicanum* DC. (1846).—Through the courtesy of Professor E. De Wildeman I have had the opportunity of studying fragments of *Galeotti 7207* from the representation of that number in the herbarium of the Jardin botanique de l'Etat at Brussels. The material is labeled *Amsinckia mexicana* Mart. & Gal. and agrees with the original description of that species, but though bearing the same number as the single collection cited by Martens & Galeotti it has different locality-data. The material is given as coming from "Mexico. prov. de. Mextitlan Sangre de Grado," not from "dans les forêts de chênes du Cerro de Quinzéo, près Morelia de Michoacan" as published. Despite this discrepancy in data, and because of the perfect agreement between material and description, I am perfectly content to refer *Amsinckia mexicana* Mart. & Gal. to *Antiphytum floribundum* DC. The latter does occur in Michoacan, Pringle, under his number 3604, having distributed specimens from the "hills of Patzcuaro."

ERITRICHIUM MESEMBRYANTHEMOIDES Speg. Anal. Soc. Cientif. Argent. liii. 136 (1902). *Plagiobothrys mesembryanthemoides* Johnston, Contr. Gray Herb. n. s. lxviii. 79 (1923).—ARGENTINA: in arid subsaline places between San Julian and Rio Deseado, Santa Cruz, 1899, *C. Ameghino* (G, part of TYPE).—This peculiar plant is not an *Eritrichium* nor is it a *Plagiobothrys*. A study of authentic, though sterile, material kindly furnished me by Dr. Spegazzini shows it to be a plant quite different from any borage known to me. The pubescence of the plant is very soft and fine, not at all suggesting that of a borage. The general habit of the plant, as Dr. Spegazzini suggested when he described it, is that of one of the *Portulaceae* and it may be that it in fact represents an anomalous species of *Calandrinia* or some similar genus.

MYOSOTIS VIRGINICA (L.) BSP. Prel. Cat. N. Y. 37 (1888); Johnston Contr. Gray Herb. n. s. lxx. 43 (1924). *Eritrichium pampeanum* Speg. Contr. Fl. Sierra Vent. 44 (1896); Johnston, l. c. 53.—ARGENTINA: common along streams in the Sierra Ventana, Buenos Aires, Sept. 14, 1895, *Spegazzini* (G, "COTYPUS" of *E. pampeanum*); hills near Nafofo-cahuellu, Chubut, March 12, 1925, *Spegazzini* (G).—Included in a highly interesting and generous packet of Argentine *Boraginaceae* recently presented to the Gray Herbarium by Dr. Carlos Spegazzini of La Platte, there was authentic material of *Eritrichium pampeanum*. This material, to my astonishment, I find to represent the widely distributed and indigenous North American

species, *Myosotis virginica*, a plant heretofore unrecorded from south of the United States. A detailed microscopic study of the plants from Argentine and the United States has revealed no differences which would justify treating the southern plant as even varietally different. It seems clear that *Myosotis virginica* must be added to that ever increasing list of borage-species which occur both in North America and in the far removed though ecologically similar regions of southern South America.

LAPPULA TEXANA (Scheele) Britt. Mem. Torr. Bot. Cl. v. 273 (1894); Johnston, Contr. Gray Herb. n. s. lxx. 49 (1924).—ARGENTINA: vicinity of General Roco, Rio Negro, *Fischer 124* (G); dry places near Puerto San Julian, Santa Cruz, 1883, *Spegazzini* (G, in part).—A form of this species, apparently the var. *columbiana* (Nels.) Johnston, l. c. 50, is to be accredited a place in the flora of Argentina. In the past this form has been undistinguished from the closely related and habitally similar *L. Redowskii* which also grows in the Argentine Republic.

PECTOCARYA PUSILLA (A. DC.) Gray, Proc. Am. Acad. xii. 81 (1876). *P. chilensis*, var. *californica* Torr. Pacif. R. R. Rep. iv. 124 (1857).—A recent study of the type of Torrey's *P. chilensis*, var. *californica* has shown conclusively that it has been consistently misunderstood. It is not a synonym of *P. linearis*, as has been supposed, but unmistakably a synonym of *P. pusilla*. The type of Torrey's variety is given as having come from the vicinity of Los Angeles, California, which is somewhat surprising since continued work by numerous collectors has not shown *P. pusilla* from that vicinity nor, for that matter, from any other part of Southern California.

COLDENIA NUTTALLII Hook. Kew Jour. Bot. iii. 296 (1851); Gray, Synop. Fl. N. Am. ii. pt. 1, 182 (1878); Johnston, Proc. Calif. Acad. Sci. ser. 4, xii. 1140 (1925). *Tiquiliopsis Nuttallii* Heller, Muhl. ii. 239 (1906). *Tiquilia parvifolia* Nutt. acc. to Hook. l. c. *Tiquilia brevifolia* Nutt. ex Torr. Bot. Mex. Bound. 136 (1859); Torr. Bot. Wilkes Exped. 410, t. 12 (1874). *Tiquilia oregana* Torr. Bot. Wilkes Exped. sub t. 12 (1862). *C. decumbens* Hauman, Apuntes Hist. Nat., Buenos Aires, i. 55 (1909); Anal. Soc. Cient. Argent. lxxxvi. 301 (1918); Johnston, Contr. Gray Herb. n. s. lxx. 59 (1924). (?) *C. nevadensis* Gandoger, Bull. Soc. Bot. France lxv. 61 (1918).—*Coldenia Nuttallii* has been known to range from western Wyoming and eastern Washington to southern Utah and the Mohave Desert of Southern California. It can now be reported from the Argentine Andes. Through the kindness of Professor Lucien C. Hauman of

Buenos Aires I have been permitted to study authentic specimens of the plant from the high Andes of Mendoza described by him as *Coldenia decumbens*. The plant proves indistinguishable from *C. Nuttallii* of the Great Basin of western United States, agreeing not only in details and in gross aspect, but in the annual duration and deeply lobed cotyledons which distinguish that plant from other American species. It is very interesting indeed to find a species of *Coldenia* occurring in both North and South America, and particularly so that *C. Nuttallii*, which has a more northerly range than any other member of the genus, occurring at low and middle altitudes of the Great Basin, should be the one that hurdles the thousands of kilometers of territory to reappear in an Andean valley and there set the southern outpost of the genus, at least in America.

2. New or otherwise interesting Asiatic Borages.

Antiotrema Dunnianum (Diels) Handel-Mazzetti, Anzeiger Acad. Wiss. Wien lvii. no. 19, pg. 239 (Oct. 1920). *Cynoglossum ? Dunnianum* Diels, Notes Royal Bot. Gard. Edinb. v. 168 (1912); Brand, Pflanzenr. iv. Fam. 252, 149 (1921).—Yunnan: between Shia Ping and San Ying, 2400 m. alt., *Rock 3199* (G); dry plain, Yangtze Watershed, eastern slope Likiang Snow Range, Pref. Dist. Likiang, *Rock 3628* (G); dry open lands, Lou Je Ssu, Yangtze Watershed, eastern slope of Likiang Snow Range, Pref. Dist. Likiang, *Rock 3701* (G); between Nau Chien and Mi Hai Ti, headwaters of the Red River, 1360–1950 m. alt., *Rock 3090* (G).—This remarkable and only recently described genus was inadvertently omitted from my paper on the Old World genera of the *Boraginoideae*, Contr. Gray Herb. n. s. lxxiii. 42–73 (1924). It has been with considerable interest, therefore, that I have studied Mr. Rock's fine representation of the plant. This study has convinced me that both Handel-Mazzetti, l. c., and Brand, l. c., are incorrect in refering the genus to the *Lithospermeae*. *Antiotrema* appears clearly to be a member of the tribe *Cynoglosseae* and seems most related to that group of Cynoglossums which Brand, l. c. 85, has segregated to form the genus *Lindelofia*. It suggests that group in habit and floral developments, but differs markedly in fruiting structures. In general form, position and attachment, the nutlets of *Antiotrema* suggest those of *Bothriospermum*, being free from the style, vertical, with the apical end downward and attached by a flat or even inwardly sloping gynobase. The nutlets of *Antiotrema* entirely lack the glochidiate appendages characteristic of *Cynoglossum*

and its close relatives, and differ from the simply tuberculate and much smaller nutlets of *Bothriospermum* in being densely and finely muriculate in addition to being more or less irregularly and coarsely papillose-rugose. In *Antiotrema* the nutlets have a dorsal margin suggesting that of *Bothriospermum*. Like the condition in the latter genus, cf. Contr. Gray Herb. lxxiii. 72 (1924), the dorsal areolas of the nutlets face one another and surround the style when *in situ*. The margin is low, rounded, thick, and callous in structure, and as in *Bothriospermum*, incloses the base of a somewhat connivent fragile cartilaginous veil. Although agreeing remarkably in fruit, *Bothriospermum* and *Antiotrema* are probably not immediately related. They are separable by their habit, inflorescence, and floral structure, *Bothriospermum* containing small leafy annuals with simple bracteate racemes and broad very short corollas and included stamens, whereas *Antiotrema* is a thick-rooted coarse perennial with paniculate racemes and cylindrical corollas with protruded stamens. Dissection clearly shows that in *Antiotrema* the radicle end of the embryo is next the attachment-end of the nutlet, and hence, at least in a morphological sense, the nutlet-attachment is apical. Only two other genera in the family have this unusual inverted nutlet-attachment, these are *Bothriospermum* of Asia and the anomalous *Harpagonella* of western North America. It has been generally assumed that the *Labiatae* and *Verbenaceae* were sharply separable from the *Boraginaceae* by having the radicle-end of the embryo inferior rather than superior. In *Antiotrema*, *Bothriospermum* and *Harpagonella* the radicle and the micropyle are inferior, quite as in the *Labiatae* and *Verbenaceae*. Though having the radicle inferior these three genera have epitropous ovules and so agree with the other *Boraginaceae* and differ from the *Labiatae* and *Verbenaceae*, which have apotropous ovules.

Lasiocaryum, nom. nov. *Orogenia* Johnston, Contr. Gray Herb. n. s. lxxiii. 65 (1924); not *Orogenia* Wats. Bot. King Exped. 120 (1871). —Several persons have called my attention to the fact that the name *Orogenia*, recently published by me, has a practical if not an exact homonym in Watson's *Orogenia*. Since the two names are etymologically the same in origin and intent and differ only in the presence or absence of a connecting vowel, a trivial difference and after all only a matter of taste, a substitute name is here proposed for the Asiatic borage. The new generic name is suggested by the pubescent nutlets of both the known species.

A recent study of the two species of *Lasiocaryum* has convinced me that the genus has a closer relative in *Chionocharis* than originally

supposed. *Lasiocaryum* and *Chionocharis* are both characterized by densely strigose nutlets, and both come from the same phytogeographic area. The pubescence, umbonate stigma, and broad leaves, of which at least the lowermost are congested, are features common to both genera and suggest a close affinity. Although future collecting may produce forms intermediate between the two genera, at present they seem readily distinguishable as follows,—*Chionocharis:* nutlets attached by a definite triangular suprabasal areola; gynobase low-pyramidal; corolla-tube not appendaged below the filament-attachment; anthers oblong; leaves all imbricate-congested; plant pulvinate. *Lasiocaryum:* nutlets attached nearly their whole length; gynobase elongate, columnar; corolla-tube appendaged mid-way between its base and the anther-attachment; anthers ovate; early basal leaves rosulate; plant erect and branched.

Lasiocaryum Munroi (Clarke), comb. nov. *Eritrichium Munroi* Clarke in Hook. Fl. Brit. Ind. iv. 165 (1883). *Oreogenia Munroi* Johnston, Contr. Gray Herb. n. s. lxxiii. 66 (1924).—Himalayas, from Kumaoan to Sikkum.

L. trichocarpum (Hand.-Maz.), comb. nov. *Microcaryum trichocarpum* Hand.-Maz. Anzeiger Acad. Wiss. Wien lxi, no. 20, p. 164 (1924).—Yunnan and Szechuan.

Trigonotis contortipes, sp. nov., herbacea prostrata annua saepe subsericeo-pubescens; caulibus tenuibus 1–4 dm. longis strigosis infra mediam partem pauciramosis dissitifoliis; foliis caulinis oblongo-obovatis vel oblongis 5–9 mm. longis firmis valde costatis integerrimis adpresse breviterque villosis aliquando ciliatis subtus paullo pallidioribus apice rotundatis mucronatis basi attenuatis; foliis inferioribus in petiolum 6–13 mm. longum attenuatis, superioribus sessilibus; floribus remotis saepe foliolaceo-bracteolatis; pedicellis gracilibus saepe contortis strigosis 2–10 mm. longis; calyce 5-fido canescenti-strigoso, maturitate vix 2 mm. longo, lobis ascendentibus linearibus obtusis; corolla caerulea, limbo patenti 4–5 mm. diametro, tubo cylindrico 1.5 mm. longo, lobis orbicularibus ca. 2 mm. diametro, fornicibus trapeziformibus retusis breviter pubescentibus; staminibus tubo medio affixis, filamentis 4–5 mm. longis, antheris oblongis 6–7 mm. longis; nuculis 1.5–2 mm. altis obscure tetragonalibus ut videtur basaliter sessiliterque affixis saepe minute granulatis glabris valde angulatis; gynobasi plana vix 0.9 alta; stigmate crasso.—YUNNAN: below Mahoang Patze, on road to Deadman's Paddock, Yangtze Watershed, east slope of Likiang Snow Range, Pref. Dist. of Likiang, *Rock 6069* (G); Yangtze Watershed, east slope of Likiang Snow

Range, alt. 4000 m. *Rock 9449* (G); alpine meadow at Ladsaka Djio, Yangtze Watershed, east slope of Likiang Snow Range, alt. 3500 m., *Rock 10637* (TYPE, Gray Herb.); alpine meadow, Yangtze Watershed, east slope of Likiang Snow Range, Pref. Dist. of Likiang, 3900–4800 m. alt., *Rock 4817* (G); stony places along rivulets on the eastern slopes of snowy mountains near Likiang, 3900 m. alt., *Schneider 1800* (G).—A species readily recognized by its contorted pedicels. It appears to be most closely related to *T. vestita* (Hemsley) Johnston, but differs in its somewhat coarser stems, annual habit, coarser tortuous pedicels and larger light-colored non-papillose nutlets.

Trigonotis Rockii, sp. nov., perennis dense caespitosa; foliis firmiter herbaceis integerrimis concoloribus enervatis sparse strigosis, basalibus ellipticis vel ovatis 12–28 mm. longis 8–13 mm. latis conspicue mucronatis basi apiceque obtusis rotundisve 1–2.5 cm. longe petiolatis, caulinis reductis sessilibus ovatis vel oblongis saepe acutis; caulibus 5–10 cm. altis erectis basi saepe ascendentibus conspicue sparseque strigosis simplicibus; inflorescentia scorpoideo-racemosa, flore infimo in axilla bracteae foliaceae ceteris ebracteatis; pedicellis 2.5–5 mm. longis strigosis saepe ascendentibus; calyce 5-partito strigoso-villoso, lobis anguste oblongis vel oblanceolato-oblongis obtusis ca. 2 mm. longis; corolla caerulea subrotata 7–9 mm. diametro, tubo ca. 2 mm. longo calycem vix superante, lobis suborbiculatis, fornicibus trapeziformibus sparse pubescentibus; filamentis supra medium tubum affixis; antheris oblongis quam filamenta duplo longioribus; stylo tubum corollae vix superante; stigmate integro disciformi; nuculis 4 obscure irregulariterque tetragonalibus ut videtur anguste basaliter affixis ca. 2 mm. longis latisque glabris inconspicue humiliterque tuberculatis; gynobasi plana.—YUNNAN: Peshive River on walls of glacier, Yangtze Watershed, Prefectoral District of Likiang, eastern slopes of Likiang Snow Range, *Rock 5256* (TYPE, Gray Herb.); below the giant glaciers on slopes of snowy mountains near Likiang, alt. 3600 m., *Schneider 3868* (G).—A very distinct species apparently most related to *T. radicans* (Turcz.) Stev. from which it is widely separated geographically and differs in its more compact habit, evident sparse strigose pubescence, nerveless firmer leaves, shorter pedicels, and brown glabrous nutlets. In gross habit *T. Rockii* much suggests *Omphalodes* but the few nutlets discovered among the debris about the roots of Mr. Rock's collection are clearly those of a *Trigonotis*.

Trigonotis vestita (Hemsley), comb. nov. *T. peduncularis*, var. *vestita* Hemsley, Jour. Linn. Soc. xxvi. 154 (1890).—Clearly distinct

from the widely distributed weedy *T. peduncularis* (Trev.) Benth. in its more persistent root, finer more appressed canescent pubescence, and larger flowers. Mr. Rock, under number *4237*, collected *T. vestita* at Ta Ho Shan in the Yangtze Watershed at 4100 m. alt. on the western slopes of the Likiang Snow Range. He notes the flowers as white.

Trigonotis tibetica (Clarke), comb. nov. *Eritrichium tibeticum* Clarke in Hook. Fl. Brit. India. iv. 165 (1883). *E. tibeticum*, var. *minor* Clarke, l. c.—Authentic material of *Eritrichium tibeticum* contained in the Gray Herbarium shows that this species is a well marked member of the genus *Trigonotis*. The extremely reduced alpine form of the species is apparently worthy of nomenclatorial recognition and may be called **T. tibetica**, var. **minor** (Clarke), comb. nov.

LITHOSPERMUM ZOLLINGERI A. DC. x. 587 (1846); Forbes & Hemsley, Jour. Linn. Soc. xxvi. 155 (1890). *Plagiobothrys* (?) *Zollingeri* Johnston, Contr. Gray Herb. n. s. lxxiii. 68 (1924).—This plant was incorrectly refered to *Plagiobothrys*. It is clearly a *Lithospermum* and is from Japan, being attributed to Java through error, DC. l. c. xvii. 319 (1873). A photograph of the type, which was made for me by Dr. H. M. Hall, shows the plant to be the common blue-flowered *Lithospermum* of Japan and China.

Microula hirsuta, sp. nov., herba 15–60 cm. alta e rhizomate crasso horizontali oriens; caulibus griseo-hirsutis laxe breviterque ramosis; foliis caulinis dissitis herbaceis integris subtus pallidioribus breviter hispidis, infimis longe petiolatis, superioribus breviter petiolatis vel sessilibus, laminis oblongis vel ovato-oblongis 2–4 cm. latis; cymulis paucifloris congestis bracteatis terminalibus vel in axillis foliorum sessilibus; calyce 5-partito, lobis lanceolatis hispidis quam corollae tubus duplo vel triplo longioribus maturitate paullo auctis conniventibus 5–6 mm. longis; pedicellis 2–4 mm. longis cernuis; corolla caerulea, tubo subcylindrico vix 2.5 mm. longo vix 2 mm. diametro, limbo ca. 6.5 mm. diametro, lobis orbicularibus ca. 2.5 mm. latis patentibus; faucibus brevibus; fornicibus 5 trapeziformibus villosociliatis 0.8 mm. longis; staminibus inclusis medio tubo affixis; filamentis 1 mm. longis; antheris oblongis; nuculis 4 pallidis minute denseque muriculatis rugosis subtrigonis acutis vix 3 mm. longis dorso medio cum areola 1–1.5 mm. longa oblonga prominenti ornatis; stylo lineari compresso 1.5–2 mm. longo nuculas vix superante.—YUNNAN: *Abies* forest at Yakolo, eastern slopes of Mt. Dyinaloko, northern peak of the Likiang Snow Range, 4100 m. alt., *Rock 10439* (TYPE, Gray Herb.); in *Abies* forest, Yangtze Watershed, eastern slope of Likiang

Snow Range, Pref. Dist. of Likiang, *Rock 5792* (G); Yangtze Watershed, eastern slopes of Likiang Snow Range, Pref. Dist. of Likiang, *Rock 4977* (US); rocky stream-ways on the snowy mountains near Likiang, 3800 m. alt., *Schneider 3657* (G); eastern slope of the snowy mountains near Likiang, 3400 m. alt., *Schneider 3640* (G).—A species related to *M. sikkimensis* (Clarke) Oliver, but differing in its slightly larger, pubescent, differently proportioned corolla, somewhat coarser habit, and lack of minute dense strigose pubescence under the coarse stiff hairs of the foliage. In *M. hirsuta* the corolla-lobes are somewhat hispid-strigose outside, the corolla-tube is scarcely one-half the length of the calyx-lobes, and the throat-appendages are villous, whereas in *M. sikkimensis* the corolla is glabrous, the tube twice exceeds the calyx, and the throat-appendages are glabrous. Furthermore the filaments are longer and the anthers are smaller in *M. hirsuta* than in its relative. *Microula hirsuta* is known only from the high snow-capped mountains in the vicinity of Likiang, Yunnan. *Microula sikkimensis* is at hand from Sikkim and western Szechuan. The plate given by Oliver, Hook. Icones xxiii. t. 2255 (1893), is not clearly diagnostic. It appears to represent *M. sikkimensis*. In this connection it may be well to mention that several fine collections of *M. myosotidea* made by Mr. Rock have rendered it certain that Franchet's genus *Schistocaryum* is indeed a synonym of *Microula*, and in addition have shown that *M. myosotidea* is related most closely to *M. pustulata* (Clarke) Duthie.

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LXXVI

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND

By M. L. Fernald

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TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND

M. L. Fernald

Part I. Journal of the Summer of 1924

In 1910 and 1911 Professor K. M. Wiegand and I spent the collecting seasons in Newfoundland, the first summer on the western, the second on the eastern side of the island. A journal[1] of the trip of 1910, when we were accompanied by Messrs. Joseph Kittredge and Alfred V. Kidder, appeared in Rhodora the following year. On the second trip our companions were Messrs. Edwin B. Bartram and Henry T. Darlington, our center being at Grand Falls on the lower Exploits, whence parties worked eastward to the islands and coves of Notre Dame Bay, southward to the Avalon Peninsula and westward to the headwaters of the Humber; and, although no detailed account of that expedition has been published, the striking contrasts between the floras of the eastern and the western sides of the island have been pointed out.[2] Again, in 1914, I went to southwestern Newfoundland for a very brief trip, primarily to secure better material of a strange *Euphrasia* which Wiegand, Kittredge and I had got in 1910 on Table Mountain, Port-à-Port Bay. This time I was accompanied by one of my students, now Prof. Harold St. John, and we had only a day and a half on the tableland of Table Mountain. The season was very

[1] Fernald: *A Botanical Expedition to Newfoundland and southern Labrador*, Contrib. Gray Herb. n.s. no. xl., Rhodora, xiii. 109–162 (1911).

[2] Fernald: *The Contrast in the Floras of eastern and western Newfoundland*. Am. Journ. Bot. v. 237–247 (1918).

backward, so that we failed to get the *Euphrasia*, but, fortunately, many plants not seen in 1910 were in prime condition in 1914. St. John and I were handicapped by so dense a blanket of fog capping the tableland that we quickly got separated and only after hours of discouraging and lonely tussle through pucker-brush did we come together after dark at our temporary camp. But, botanically, Table Mountain lived up to the high standard it had established in 1910 and we brought back 14 additions to the flora of Newfoundland, including the type material of *Carex misandroides* Fernald,[1] *Salix leiolepis* Fernald, *S. myrtillifolia* var. *brachypoda* Fernald, *Antennaria albicans* Fernald and *Arnica pulchella* Fernald.

The success of the expeditions to western Newfoundland began to stimulate others to try their luck and for two summers Messrs. Ludlow Griscom and Kenneth Mackenzie went to Bay of Islands, Port-à-Port Bay and Bay St. George; but, although the West Coast with the Long Range and its western spurs and often calcareous foreland is always alluring, I was growing more and more conscious of the complete inadequacy of our knowledge of some regions near the eastern and southern sides of the island, particularly the area back of Bonaventure and Trinity; the region about Trepassey, near Cape Race; and the southern coast, east of the Long Range. La Pylaie, Despreaux, Steinhauer, Cormack and other early collectors had carried back to Europe or had reported from southern and eastern Newfoundland many species which are characteristic of western Europe and in some cases the evidence of the species in North America rests solely on their collections or records. Some, such as *Juncus bulbosus* L. (*J. supinus* Moench) and *Potentilla procumbens* Sibth., had been rediscovered and are now well known members of the indigenous flora of southeastern Newfoundland. Others of Atlantic Europe, such as *Potamogeton polygonifolius* Pourret, *Glyceria fluitans* (L.) R. Br., *Sieglingia decumbens* (L.) Bernh., *Juncus effusus* var. *conglomeratus* (L.) Engelm. (*J. conglomeratus* L.) and *Montia rivularis* C.C. Gmel., were added to the Newfoundland flora by Robinson & Schrenk in 1894; and others, including *Agrostis canina* L. and *Festuca capillata* Lam., by Howe & Lang in 1901. Waghorne and his associates increased the number by discovering *Ranunculus hederaceus* L. and *R. Flammula* L., and Wiegand and I in 1911 further augmented the list with the large-

[1] In this account the author of the species will be given only at the first mention of the name; afterward omitted.

panicled typical *Deschampsia cespitosa* (L.) Beauv., the delicate pink-flowered *Pedicularis sylvatica* L. and some other species.

Still, some of the reports needed verification: the reputed collection by Despreaux of *Carex remota* L., by La Pylaie of *Juncus acutiflorus* Ehrh., by Steinhauer of *Saxifraga Geum* L., by Cormack of *Arbutus Unedo* L., and by La Pylaie, Cormack and others of *Calluna vulgaris* (L.) Hull. The first two might easily have been misidentified, but surely the last three could hardly be mistaken; and *Saxifraga Geum* and *Arbutus Unedo*, if they should actually prove to be indigenous in Newfoundland, would be almost dramatic in interest. The Saxifrage is one of the most local of European species, belonging to a relic flora which is otherwise confined to the Lusitanian region and to southwestern Ireland; while Arbutus, although of broad Mediterranean range, is known north of Spain and Portugal only in southwestern Ireland. Of these remarkable plants Praeger, in his *Tourist's Flora of Western Ireland*, says:

> South-west European group.—The characteristic range of the plants of this group embraces Spain, Portugal, SW. France, SW. England and W. Ireland. Two of the constituent species, *Saxifraga Geum* and *Sibthorpia europaea* (the first absent from Great Britain, the second present in S. and W.; both on the Continent confined to the SW.), are in Ireland found only in Kerry and Cork. . . . A third plant of the Kerry group, *Arbutus Unedo*, only differs from *S. Geum* in extending its Continental range all along the Mediterranean.[1]

The Newfoundland occurrence of *Saxifraga Geum* rests on a collection recorded by Dr. N. L. Britton, as follows: "There is a specimen of this species in Durand's Herbarium at Paris, collected by the Rev. Mr. Steinhaur, in Newfoundland. It is erroneously labeled by Durand *S. spicata*, Don. This appears to be the first indication of its occurrence in America."[2] As to *Arbutus Unedo*, the Newfoundland record was by Cormack in his *Narrative of a Journey across the Island of Newfoundland*, the mere note that the shrub occurs "on the summits of the hills" near Bonaventure. Cormack was a keen observer and his plants were presumably identified by Jameson, who surely knew *Arbutus*. There is no shrub in Newfoundland which even a casual observer would be likely to confuse with *Arbutus Unedo*, except possibly *Viburnum cassinoides* L., but Cormack clearly knew the Viburnum and wrote of it by name. He may have intended *Arbutus*

[1] Praeger, Tour. Fl. W. Irel. 25 (1909).
[2] Britton, Bull. Torr. Bot. Cl. xviii. 270 (1891).

alpina (now *Arctostaphylos*) but elsewhere in his *Narrative* he speaks of the latter by its correct name.

Calluna vulgaris, the Heather or Ling, has been many times reported from the southeastern section of the Avalon Peninsula and it was recorded by Sir William Hooker, in a foot-note from the Index of his *Flora Boreali-Americana*, as follows: "This should have been inserted at p. 39, as an inhabitant of Newfoundland, on the authority of De la Pylaie." In the period from 1861 to 1864 many records of *Calluna* as a Newfoundland plant were published, but the most significant was by Seemann:

> The doubt still lingering about the occurrence of this plant in America is dispelled by a lucky find of Mr. Hewett C. Watson. Amongst the plants he bought at the sale of the Linnean Society's Collections in November, 1863, there was a parcel labelled outside, "A Collection of Dried Plants from Newfoundland, made by—Mac Cormack, Esq.,[1] and presented to Mr. David Don"; and in this parcel were found two specimens of *Calluna vulgaris*, with the following label:—"Head of St. Mary's Bay; Trepassey Bay also very abundant, S. E. of Newfoundland, considerable tracts of it." These specimens, as far as they go, agree exactly with our European ones, but unfortunately they have no flowers. . . . . .
>
> Mr. Watson's specimens place it beyond doubt that a plant very closely allied to, if not absolutely identical with the *Calluna vulgaris* of the Old World covers large tracts of Newfoundland . . . it is common in Ireland, Iceland, and the Azores, and its extension to Newfoundland and the American continent is therefore not so much a paradox as a fact, at which we might almost have arrived by induction.[2]

Somewhat later Watson, himself, gave an account of his discovery, adding in regard to the Cormack package: "The specimens were old, and greatly damaged by insects. Apparently, they had been left in the rough, as originally received from the collector; being in mingled layers between a scanty supply of paper, and almost all of them unlabelled."[3] Others proceeded to collect *Calluna* in southeastern Newfoundland and in 1866 Seemann described from cultivated material, said to have come originally from Newfoundland, *Calluna atlantica*,[4] a species not now generally maintained as distinct from the European *C. vulgaris;* and Reeks, in 1873, wrote: "Through the kindness of the Bishop of N.F.L., I have recently received a liberal supply of this

[1] "Probably W. E. Cormack (supposed to have been a merchant), who made several voyages to Newfoundland. In copying his name 'Mr.' was probably mistaken for 'Mc'."

[2] Seemann, Jour. Bot. ii. 55, 56 (1864).

[3] H. C. Watson, Nat. Hist. Rev. xiv. 312 (1864).

[4] Seemann, Journ. Bot. iv. 306, t. 53 (1866).

plant in flower. The specimens were gathered near Capelin Bay in about 47° N.L., and 53° West long." [1]

This array of seemingly authoritative data, to which much more might be added, indicating the comparative frequency of *Calluna* in the southern part of the Avalon Peninsula, was a bit irritating to one who had devoted much time to botanical exploration in Newfoundland but who had never seen *Calluna* growing wild; and the less thoroughly attested, though much more thrilling records of the occurrence in the region of *Saxifraga Geum* and *Arbutus Uncdo* still further kindled the imagination. And, since Wiegand and I had personally seen, as indigenous plants of southeastern Newfoundland, many European species which are rare or unknown on the continent of North America, I had long felt that the next botanical trip to Newfoundland certainly ought to be to the southeast corner, from Trinity Bay to Cape Race and Trepassey.

Before this plan could be carried out, however, another region of Newfoundland began to assume botanical importance—the south side of the Straits of Belle Isle. The only records which we had had from the Straits were those of La Pylaie from Quirpon, at the extreme eastern end of the Straits, some interesting things but nothing remarkable enough to indicate that the region needed further exploration; and a single record from Flower Cove at the extreme western end of the Straits: *Caltha palustris*, a species common on the West Coast. But when she went to Flower Cove to take charge of the Grenfell hospital there, Miss Mary E. Priest most kindly offered to collect and send to me some plants of the region. These collections, made in Miss Priest's very rare moments of leisure in 1920 and 1921 and mostly from near the hospital, were indeed a revelation: many species such as our representative of *Parnassia palustris* L. and *Lomatogonium rotatum* (L.) Fries, the records of which in Newfoundland had rested exclusively on the authority of La Pylaie a century ago, or of Banks a full half-century earlier (1766); others, like *Festuca vivipara* (L.) Huds., *Salix arctophila* Cockerell, *S. reticulata* L., *Draba megasperma* Fern. & Knowlt. and *Cochlearia tridactylites* Banks, which had been known for the most part from only a single station; and 11 quite new to the flora of Newfoundland: *Eriophorum opacum* (Björnstr.) Fern., a species characteristic of Lapland and the Canadian Rocky Mountain region; *Carex microglochin* Wahlenb., one of the

[1] Reeks, List Fl. Pl. & Ferns of N. F. 4 (1873).

most famous of rarest sedges, here found for the first time in eastern America; a form of *Habenaria viridis* (L.) R. Br., an arctic-alpine orchid of Europe, now recognized for the first time in the flora of North America; *Arenaria peploides* var. *diffusa* Horneman., *Cerastium alpinum* var. *lanatum* (Lam.) Hegetschw., *Alchemilla vulgaris* var. *vestita* (Buser) Fern. & Wieg., *Primula farinosa* var. *incana* (M. E. Jones) Fern. and *Gentiana propinqua* Richardson, these five already known from the Labrador side of the Straits and consequently to be expected; *Statice labradorica* (Wallr.) Hubb. & Blake (var. *genuina* Blake), the first time south of the Torngat region of northern Labrador; *Primula egaliksensis* Wormsk., a Greenland species which has been very poorly if at all represented in American herbaria; and one of the original collections of *Tanacetum huronense* var. *terrae-novae* Fernald.

These collections were thrilling, for Miss Priest was not a trained botanist, her duties at a mission-hospital on a rough coast were exacting and time-consuming and she had to spend much of both summers "on the Labrador"; and the long-dreamed-of plan, that the next Newfoundland expedition should be for Atlantic European types near Cape Race, began to be confused by an equally urgent ambition to go directly to the Straits. The Mt. Logan campaign of 1923 had been organized, however, and Newfoundland field-work had to be postponed until 1924. In 1923, while I was in the mountains of Gaspé, the Biological Board of Canada undertook a survey of the Straits of Belle Isle and the invitation to join in this enterprise reached me too late for action. Consequently, the efficient Director of the Board, Dr. A. G. Huntsman, himself collected such land plants as came his way. He was quite impartial as to whether he collected on the Labrador or the Newfoundland side of the Straits and he disclaimed any technical botanical knowledge or ability to recognize species of special interest. His collection showed, however, that *Primula egaliksensis* and *Gentiana propinqua*, found for the first time in Newfoundland by Miss Priest, were common the whole length of the Straits; that *Phleum alpinum* L., *Poa eminens* J. S. Presl, *Stellaria crassifolia* Ehrh., *Hymenolobus procumbens* (L.) Nutt., *Lomatogonium rotatum* and *Euphrasia arctica* Lange were not so rare as had been supposed; and he had *Rumex occidentalis* Watson and *Erigeron borealis* (Vierh.) Simmons, new to the island (as well as a few additional species from Notre Dame Bay and Bay St. George).

It was, therefore, quite natural, when Messrs. Bayard Long, Boyd

Dunbar and I started from Boston in July, 1924, ostensibly to go to Trepassey and to Bonaventure to search for *Calluna vulgaris* or *atlantica*, *Saxifraga Geum*, *Arbutus Unedo* and other Atlantic European species which might be associated with them, that we began to reason in this fashion: "We shall land at the southwest corner of Newfoundland, at Port aux Basques; the train runs almost half-way to the Straits west of the Long Range before swinging eastward across the island; the "Home" sails every Wednesday evening from Humbermouth for the Straits; consequently, it would be botanically almost a crime 'to not take he' (Newfoundlandish) north 'down to the Straits' over just one trip." Yielding to this and similar reasoning, we began to shift the itinerary. We landed at Port aux Basques early on the morning of Sunday, July 20, and we knew that the "Home" would not sail from the Bay of Islands until Wednesday night; so, after passing the Customs, we hunted up a boarding place at Port aux Basques, Mrs. Ben. Billard's, a clean and comfortable home, Mrs. Billard being a kind and motherly landlady and one of the best cooks we have ever had the pleasure of meeting in Newfoundland—a place we later looked back to with yearning stomachs.

Port aux Basques itself is on a granite outcrop, but a few miles to the east and north rise the sharp gneissic and schistose crests of the Long Range and, remembering that it was only slightly to the north, on the vast Table Mountain of Cape Ray, that Professor A. P. Coleman had found an extensive area of unglaciated summit, we started hopefully toward the southern end of the Table Mountain mass. The great interest of western Newfoundland lies in the fact that, although local glaciers scoured and altered the surface deposits of central and eastern Newfoundland, the high tablelands of the Long Range and the mountains to the west seem largely to have escaped Pleistocene denudation, and that in this region of but slightly glaciated tablelands we find a phenomenal number of highly localized species isolated from the cordilleran area of America, the unglaciated Arctic Archipelago, and regions of Asia, Europe and northwestern Greenland which were outside the later advances of Pleistocene ice. The occurrence of these isolated colonies or of endemic representatives of cordilleran, Asiatic or high arctic types in western Newfoundland had long been occupying my attention, and shortly before leaving Cambridge I had turned in for publication a discussion of the question.[1]

[1] Fernald: *Persistence of Plants in Unglaciated Areas of Boreal America* (Mem. Gray Herb. ii). Mem. Am. Acad. xv. No. iii (1925).

We were, therefore, anxious to utilize this opportunity to reach the unglaciated crest of the southern tip of the Long Range.

Long and Dunbar had never been in Newfoundland and, in spite of written and verbal accounts, were really not prepared to find the alpine flora of Mt. Washington growing at sea-level in latitude 47° 30′, there mingled with typical species of the New Jersey Pine Barrens and the southern coastal plain,[1] the latter plants often ascending to the highest mountain-crests. And with these species of such different geographic origin there occur on the mountain-barrens back of Port aux Basques, as elsewhere through the whole breadth of southern Newfoundland, several species which on the continent we consider as introductions from Europe, but which in Newfoundland are clearly indigenous. Thus, in our two days in the field back of Port aux Basques we were constantly finding on the bare ledges *Festuca capillata* Lam. (European) quite as definitely indigenous as the arctic *Diapensia lapponica* L., *Carex rigida* Good., *Loiseleuria procumbens* (L.) Desv. or *Arctostaphylos alpina* (L.) Spreng. with which it grew; while in wetter pockets or on seeping banks the European *Agrostis canina* L. was found as far back and as high (about 1000 feet) on the uncultivated slopes as we had time to ascend, and with it or in similar habitats were the arctic *Carex stylosa* C. A. Meyer and *C. rariflora* Sm. and the Pine Barren *Schizaea pusilla* Pursh, *Lycopodium inundatum* var. *Bigelovii* Tuckerm. or *L. adpressum* Lloyd & Underw. (the latter new to Newfoundland) and, in pools, *Potamogeton confervoides* Reichenb. and *Utricularia geminiscapa* Benj. (*U. clandestina* Nutt.).

The fascination of the lower slopes and barrens, the necessity of properly caring for our collections and the encountering, on our second day, of an impassible mountain-stream, kept us from reaching the unglaciated tablelands. Scattered at all levels on the slopes were colonies *of Luzula campestris* var. *congesta* (Thuill.) Meyer, a plant well known in Eurasia and from British Columbia to southern California but not heretofore in eastern America; and in a bit of hudsonian thicket bordering a seepy bank Long found a small colony of *Mitchella repens* L., the Partridgeberry of the eastern States, for which the Newfoundland record was doubtful. There was only a tiny patch, and the corolla was white and odorless, quite lacking the pink tinge and the delicious fragrance of the plant of the continent. But we found two

[1] See Fernald: *A Botanical Expedition to Newfoundland and southern Labrador*, Rhodora, xiii. 135–162 (1911).

other species which we had not previously thought of as peculiarly fragrant. One was the ubiquitous *Rosa nitida* Willd. This shrub was in such beautiful condition that we yielded to the temptation to put some into our collecting boxes, although herbaria are full of Newfoundland specimens. Opening our boxes in the evening, we were surprised by a delicious and pervading fragrance as of tuberoses (*Polianthes tuberosa* L.). This came from the flowers of *Rosa nitida* and our respect for the common rose of southern and central Newfoundland vastly increased. The other peculiarly fragrant plant was the endemic ragged orchis of Newfoundland, *Habenaria lacera* var. *terraenovae* Fernald,[1] a characteristic plant of bog and tundra, with cream-white to crimson-lake flowers and a most delicious fragrance suggestive of lily-of-the-valley, *Convallaria*.

Wednesday morning we were on hand for the departure of the tri-weekly train which was to leave at 8 o'clock for Humbermouth and St. John's. In the old days, when this was the Reid road, jokes about the train and its never crossing the island without getting off the track were endless, but now it is the Newfoundland Government Railway and as we inspected the little engine our Yankee sense of humor was tickled by the symbol: "N. G. Ry." But we got away promptly and in half an hour were making great speed along the rails near Cape Ray when, bang! there was a sudden jolting and crashing. Rushing out the door opposite the vestibule of the dining car, I received a flying kettle of hot oatmeal porridge on my one respectable suit of clothes and slid in the slime off the platform. The poor little N. G. engine was out of sight over the bank and, heaped in ruins on top of it, were the two express, mail and baggage cars, with the tracks ripped up and thrown into fantastic curves. Worst of all, the fireman and mail-clerk had been instantly killed, the engineer was pinned under the wreckage and scalded nearly to death and the brakeman was so firmly wedged between two cars that it took an hour of prying with telegraph poles to extricate him. There was no engine at the Port aux Basques end of the line and it was late in the evening before a wrecking train arrived from the north, and afternoon of the next day before the passengers could be started north and east. We pictured the "Home" as then well on the way to the Straits of Belle Isle and our consciences whispered that we were being punished for yielding to the temptation to abandon Cape Race for the allurements of the opposite corner of

[1] Fernald, Rhodora, xxviii. 21 (1926).

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the island. But as we approached the Bay of Islands the conductor informed us that the "Home" had run aground in the Straits and that the "Glencoe," substituting for her, was awaiting the arrival of our train at Curling before proceeding north.

The "Glencoe" reached Flower Cove Saturday afternoon and on the wharf we identified Parson Richards, the English Church missionary of the Straits, a rare man to find in such a remote region, cultured, up-to-date and alert. With his aid we quickly found a home at the house of Mrs. John Whalen, mother of many sturdy sons and many times a grandmother, known to all the community as "Aunt Eliza"; and then Parson Richards got his push-cart and, in the generous spirit which we soon learned to expect in him, insisted on helping us trundle our heavy trunks over the ledgy and peaty lane from the wharf to our new home.

The metropolis of the Straits of Belle Isle has its fishermen's houses, its wharves and its warehouses straggling along the shores of three coves at the southwestern entrance to the Straits; French Cove at the southwest, where the harbor, the principal wharves, the custom house, court house, post-office, English church and the stores are located; then, separated from French Cove by Capstan Point, the real Flower Cove, too open to the Straits for a good harbor; then, east of Flower Cove and separated from it by Nameless Point, where another considerable colony lives, comes Nameless Cove. Eastward beyond there, come cove after cove with their respective fishing colonies and their intermediate points: Mistake Cove, Yankee Point, Savage Cove, Savage Point, Sandy Cove (the name changed in these sophisticated days from the older Poverty Cove) and so on to Eddies Cove, then the Long Straight Coast, Big Brook, Boat Harbor, Cape Norman, Cape Onion, Cape Raven, Cape Bauld and, way in the offing, Belle Isle itself. The country back of Flower Cove is almost as flat as an open prairie, consisting of horizontal white limestone which shelves so gradually into the sea as to make navigation extremely ticklish. Inland and southward there is an alternately treeless and woody sky-line, with an occasional low limestone escarpment rising ten or perhaps twenty feet; but the only elevations of note seen to the south of Flower Cove are visible only on the clearest days: Bard Harbor Hill and Doctor Hill (together forming the Highlands of St. John of maps and charts—a name never used by the natives), rising 1900 feet from the shore of St. John Bay.

Our first walk was a stroll after supper around Capstan Point. We were strangers and the young sledge-dogs of the community promptly recognized us as such and, in our inexperience, we were nearly knocked down by the big good-natured puppies all jumping upon us at once and anxious to give us a welcome—or perhaps to get something novel to eat. The drying stages for the cod ran from the houses down to the shore; in many yards great frames covered with stretched and curing seal-skins stood like targets beside the upturned sledges, and tepee-like stacks of logs for firewood, hauled in winter by dog-sledge from the woods five miles back, added further novelty to the picture. Enclosed in high fences in almost every yard were the older dogs, forbidden by Newfoundland law to run free in summer, yelling and snarling in a hundred different tones and keeping up a chorus (the "Labrador band") from sunset to sunrise. On a submerged ledge at the entrance to Flower Cove lay a big black coal-steamer, the *Njordfjeld*, aground and abandoned with her cargo some years ago, with the result that every family on this coast has a fine stock of anthracite. One devout soul unblushingly said, "We has enough coal for fifteen years and before that time we prays God to bring another wreck to we." Some of the women and girls were bringing pails of water on shoulder-yokes from the springs outside the village, others were milking the cows, and the men were working on their seal-skins. This was all a new life to us and, when we got outside the little village and felt the stiff north wind blowing right across from the icebergs which had stranded near Point Amour, we began to imagine ourselves in Greenland or in Lapland rather than in latitude 51°.

And this impression was intensified as soon as we saw the solid carpets of color displayed by the arctic plants on Capstan Point: the turfy border of the limestone shingle a veritable maze of Greenland and Lapland species, with a good sprinkling of Alaskan or Siberian types and a few species endemic to eastern America to differentiate this from more northern arctic spots. *Salix reticulata* L., with purple-veined orbicular leaves, *S. cordifolia* Pursh, with grayish foliage, *Lonicera villosa* (Michx.) R. & S., grayish and velvety, *Shepherdia canadensis* (L.) Nutt, golden-bronze and silvery, *Arctostaphylos alpina* and *Silene acaulis* var. *exscapa* (All.) DC. formed broad flat carpets through which projected *Botrychium Lunaria* (L.) Sw., *Stellaria longipes* Goldie, the whole plant strongly whitened, *Festuca vivipara*, forming dense clumps with plumes of leafy tufts replacing the in-

florescences, *Primula farinosa* L., with lilac flowers, and dozens of other fascinating species. There were great carpets of *Gentiana nesophila* Holm, like our sky-blue Fringed Gentian but lower and fleshy, and with it the lilac-flowered *G. propinqua* or its close relative, *Lomatogonium rotatum*, with porcelain-blue to white rotate corollas. The handsome plant which had been mistaken for *Parnassia palustris*, but which is separated from the European plant by many characters (to be discussed in Part III), beautiful with its abundant creamy-white flowers, abounded; the moss-like *Saxifraga cespitosa* L., with erect milk-white flowers, made dense turf; the little "Plumboy," *Rubus acaulis* Michx., was in full bloom, a dwarf herbaceous raspberry, its showy rose-red flowers with a fragrance like that of *Epigaea repens*. *Primula egaliksensis*, which we had been most anxious to see, was unmistakable, with its strictly erect pedicels and white flowers; a little plant with crisp white pubescence, which we took to be *Euphrasia Oakesii* Wettst., the tiny alpine species of the White Mountains, abounded, although insignificant beside the large bushy-branched *E. arctica* and *E. disjuncta* Fern. & Wieg.; and of course there were the inevitable displays of Harebell, *Campanula rotundifolia*, "Wild Tansy," *Achillea Millefolium* var. *nigrescens* E. Meyer, *Anemone parviflora* Michx., *Draba incana* L. and *rupestris* R. Br., *Arabis alpina* L., *Thalictrum alpinum* L., *Cerastium Beeringianum* Cham. & Schl., and many others, every one of them adding to the picture and giving us a new thrill.

Naturally we did not now care whether the "Glencoe" called on the return trip Monday. We had no further interest in her, and Cape Race and Trepassey were far from our thoughts. So we stayed over "just one more" trip—another week; and in all that time, collecting all day and caring for our plants late into the evening, we only once got more than half a mile from the village. The springy swales were full of a very delicate *Epilobium*, with narrowly linear and repand-denticulate leaves and abundant arching basal branches, *E. wyomingense* A. Nelson, heretofore known only from Yukon to Utah; and in all damp thickets or springy slopes *Taraxacum lapponicum* Kihlm. abounded, while another dandelion or "Dumble d'Or" still lingered in flower, a plant with extraordinary rhombic appendages to the long recurving bracts, *T. lacerum* Greene, another cordilleran species which we had not known in eastern America. A stone's throw from the parsonage there was a shallow pool bordered by the snowy white

arctic cotton grass, *Eriophorum Scheuchzeri* Hoppe, which we had not definitely known from Newfoundland, and as we hurried toward it the quality of the turf under foot suddenly changed and we found ourselves in a dense carpet of a strange sedge with short arching culms and dense chestnut-brown heads, *Carex incurva* Lightf., which we had not known south of Cape Chidley at the entrance to Hudson Straits. This exciting little sedge formed compact turf and it took a full hour to dig out and properly to clean the specimens—a task prolonged and rendered difficult because a pack of half-grown puppies discovered us and insisted on competing with our hand-picks in digging the specimens, and then they proceeded to tear to pieces those we had already cleaned. When at last we got to *Eriophorum Scheuchzeri* and pulled in some sods we found that another arctic species, likewise new to Newfoundland, was creeping among the culms, *Ranunculus hyperboreus* Rottb., a tiny plant with 3-lobed leaves and pale flowers and 3 sepals and 3 petals.

We had been particularly looking forward to collecting *Carex microglochin*, not on account of its beauty, for it looks like a needle with a few scales at the summit, but because it is one of the rarest and taxonomically most interesting of species, having the primitive rachilla, which is obsolete in most modern *Carices*, projecting from the tip of the perigynium; in other words, *C. microglochin* is an excessively local relic-species now known in only a few remote corners of the globe and about as well placed in the Antarctic genus *Uncinia* as in the great genus *Carex* which abounds in the northern hemisphere. Consequently, when we first came upon this unpretentious but truly aristocratic plant, scattered and rare as we felt it ought to be, we carefully dug the individuals and gently tucked their bristly tops into paper bags that we might lose none of the precious fruits; at that stage we spoke of it by its full name, *Carex microglochin*, and had a feeling that we ought to give it some title. A little later, finding it more common than the few straws in herbaria could possibly suggest, we began to feel familiar and called it "Mike"; then, as the week wore on and we saw it in every low place in the lime-barrens, we referred to it as "Mike O'Glochlin"; and before we had left the Straits Coast, noticing that it followed many paths where its prickly little fruits had obviously been spread by pedestrians with their high skin-boots, our attitude had completely changed and we spoke of it as "Mike O'Glochlin, the Bootlegger."

Beyond the low escarpment which rises southeast of the harbor is

the Rock Marsh, a broad barren with alternating areas of tundra, swale, thicket, pond and limestone pavement. Here in the wet depressions abound the curious sedge, *Kobresia simpliciuscula* (Wahlenb.) Mackenzie, the pale-headed rush of Greenland and the Canadian Rockies, *Juncus albescens* (Lange) Fernald, the Norwegian and Rocky Mountain cotton grass, *Eriophorum opacum*, the trailing Greenland willow, *Salix arctophila* Cockerell, a species with small lustrous leaves and great black-scaled catkins seeming wholly out of proportion to the size of the shrub. Closely mingled with these and dozens of other choice species were the plebeian Bog Bean, *Menyanthes trifoliata* L., "Indian Jug," *Sarracenia purpurea* L. and "Tobacco Leaf," *Sanguisorba canadensis* L.; and I well remember Long's disgusted remark: "Up here, Bog Bean hobnobs with the best of 'em."

Except for the scattered thickets of spruce and fir we might, when we stepped upon the rock barrens, have been 20 degrees farther north, on the Arctic Archipelago or in arctic Alaska; the rock was deeply rotted limestone pavement, with ragged and long-weathered angular fragments and deep perpendicular-walled chasms. *Salix reticulata*, still fascinating to us, a species of wide arctic dispersal, the strange *S. calcicola* Fern. & Wieg., with sessile reniform to round-cordate leaves, persistent stipules and fat terminal aments, like candles on a candelabra, the eastern representative of the Alaskan *S. Richardsonii* Hook., and the more familiar Lapland Rosebay, *Rhododendron lapponicum* (L.) Wahlenb., the Purple Saxifrage, *Saxifraga oppositifolia* L., and the most widely spread shrub of the Arctic Archipelago, *Dryas integrifolia* Vahl, formed the carpet. In the drier gravel the brown-headed *Antennaria cana* (Fern. & Wieg.) Fern., a western Newfoundland representative of the arctic *A. alpina* (L.) Gaertn., abounded; *Carex rupestris* All. formed close turf and the tiny *C. glacialis* Mackenzie, of arctic Eurasia, Greenland and Alaska, formed characteristic little tufts, as it does the length of the limestone belt of western Newfoundland. In damper gravels or moist pockets in the ledges, the rigid *Equisetum variegatum* Schleich., the yellow-flowered *Saxifraga aizoides* L. and the easily overlooked *Arenaria dawsonensis* Britton were frequent; and we were particularly glad to get good material of *Allium Schoenoprasum* var. *sibiricum* (L.) Hartm., for Wiegand's and my material collected in 1910 was different from the plant of ledgy shores in the northern United States and Canada. This additional material is like all other from western Newfoundland and seems to be

true var. *sibiricum*, the plant of rocky shores across the continent being different in some details to be discussed in Part III.

Returning from the Rock Marsh, we followed a trail which brought us through a springy swale back of the hospital. There, among other interesting things, was a bronze-panicled grass with very contracted inflorescences and large spikelets. At first we took it for a *Deschampsia* but it proves to be *Agrostis melaleuca* (Trin.) Hitchc. of Alaska and mountain-meadows southward in western America.

Daylight in early summer at latitude 51°–52° is so much longer than we are used to in the latitudes from Boston to Philadelphia that we never knew when to stop work, and many a fisherman and his family there retire in summer at 11 o'clock or later, when it gets dark, and are up at dawn and attending to their cod-traps at 2. We did not have quite their necessity to utilize all the daylight during the fishing season; but one evening, while Long and I were calling on Parson and Mrs. Richards, Miss Fitch, one of the Grenfell workers, came to remind me that I had promised to supply Miss Meister, who was in charge of the hospital during Miss Mahoney's absence, a series of specimens of edible wild plants of the Straits. Accordingly, as it was only 10 P.M., we all started along shore toward the hospital, gathering in the early twilight such edible plants as were available in that short distance: "Alexanders" (*Ligusticum scothicum* L.), "Heltrope" or "Embloch" (*Heracleum lanatum* Michx.), "Goose-tongue" (*Plantago oliganthos* R. & S.), "Cowslip" (*Caltha palustris*), Dock (*Rumex occidentalis* and *R. Patientia* L.), Nettle (*Urtica* sp.), Wild Spinach (*Atriplex glabriuscula* Edmonston), "Dumble d'Or" (*Taraxacum* sp.); and when we reached the hospital we did not really need the cocoa and cakes Miss Meister provided, for each of us had been nibbling one or another of the native salads of the sea-shore: Scurvy Grass (*Cochlearia tridactylites*), Sea Purslane (*Arenaria peploides*), Rose Root (*Sedum roseum* (L.) Scop.) or Sea Rocket (*Cakile edentula* Bigel.). I was urged to write out directions for recognizing and cooking the collection and as fast as I finished one sheet it was copied by several hands, while one or two of the young ladies made drawings of the plants. When we got through there was a limited, illustrated edition, autographed and ready for use by teachers along the coast; but it was 1:30 A.M.! Miss Fitch had to be teaching school four miles away at 9 o'clock, Miss Meister must walk next day sixteen miles with her heavy kit to attend cases at Eddies Cove and we had planned to get an early start on an all-day trip to Sandy (or Poverty) Cove.

(*To be continued*)

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND

M. L. Fernald

(*Continued from page 63.*)

There was still plenty to do nearer home but Miss Priest had collected Thrift, *Statice labradorica*, at Sandy Cove and Long was anxious to add that to his already extended list of "seen-for-the-first-timers." When we passed the hospital Miss Meister had not yet started, so we detailed Dunbar to help carry her bags as far as our roads coincided and Long and I headed for Sandy Cove, vowing to keep our eyes shut

to anything which might tempt us from the path. It was "a clever mornin'," so clear that the red cliffs of southern Labrador stood out sharply across the Straits and, although ten or twelve miles away, their strata showed with diagrammatic sharpness. The roadside swales and peaty barrens were a brilliant patchwork of color: great white, cottony clumps of *Salix candida* Flügge; acre upon acre of the superb blue-violet flowers of *Iris setosa* var. *canadensis* Foster, with here and there clumps of intenser color and some almost white; Butterwort, *Pinguicula vulgaris* L., so like a violet in superficial appearance as constantly to deceive us; the three Primroses, the lilac *Primula farinosa* in many forms, the pink or white *P. mistassinica* Michx. and the smaller white *P. egaliksensis;* pink or crimson racemes of *Pyrola asarifolia* var. *incarnata* (Fisch.) Fern.; white flowering and bright-red fruiting racemes of Bog Asphodel, *Tofieldia glutinosa* (Michx.) Pers., and greenish-white spikes of the tiny *T. minima* (Hill) Druce; uncounted thousands, perhaps millions of deliciously fragrant milk-white wands of "Scent Bottle", *Habenaria dilatata*[1]; more delicate aromatic racemes of "Hyacinth," *Smilacina trifolia* (L.) Desf.; great gardens of trim *Anemone parviflora* Michx., with lustrous and handsome foliage and really large, rather than small, widely spreading white sepals tinged outside with blue. These and many others which had not lost their charm crowded the sides of the road but, having collected them, we were able to keep to the straight and peaty path toward Sandy Cove.

But when, slightly before we reached Savage Cove, a few triangular fronds of a wonderfully delicate fern attracted our attention in the roadside thicket, the temptation was too much for us. I had already grown familiar with but not hardened to *Cystopteris montana* (Lam.) Bernh. in the Shickshocks, but it is not a fern to neglect, and Long had never seen it; besides, it was new to Newfoundland. So we were soon botanizing the openings in the spruce thicket near Savage Cove, fascinating springy and mossy glades full of the Cystopteris, the moss-like *Selaginella selaginoides* (L.) Link, the flexuous black-topped *Carex atratiformis* Britton, *Listera convallarioides* (Sw.) Nutt. with watery-amber racemes and *Salix vestita* Pursh, one of the most beautiful of willows, with deeply rugose rounded leaves dark green above but white beneath with a dense silk.

[1] One girl, when asked the name of this deliciously fragrant orchid, replied: "We calls it 'Scent Bottle' and some folks calls it 'Smell Bottle,' but that ain't the right name; the right name's 'Water Lilies'."

After repeatedly tearing ourselves away from such spots, which must wait until next time, we reached Sandy Cove and we knew at once where *Statice* grew, for east of the village there rose a bare ridge of whitish limestone pavement and gravel; and we made directly for it. At the foot we stopped for *Taraxacum ceratophorum* (Ledeb.) DC., new to our series of Newfoundland species. In the border of a little pool *Carex bicolor* All. was growing, very scarce but certainly it, a European species for which we had but a single American station (on Ingornachoix Bay). Through the prostrate mats of "Soapberry," *Shepherdia canadensis*, "Blackberry," *Empetrum nigrum* L., and Fly Honeysuckle, *Lonicera villosa*, and the various arctic willows, scattered plants of *Habenaria viridis* were projecting, short "chunky" little plants with large green or greenish purple flowers, the plant which Miss Priest had added to the known flora of North America. When we had satisfied ourselves with the lower slope and the shore and had reached the upper level of the barren it was 5 o'clock, and we were due at supper at Parson Richards's at 6:30. Long and I had been reinforced by Dunbar after he had violated Straits custom by helping a woman carry a heavy load.

On the Straits the men are inclined to hold to the archaic notion of women and they seem mildly surprised and perplexed when a "Grenfell girl" from the outside intimates that, instead of walking empty-handed while "the woman" lugs the load, they should change the programme. It is not unusual to see a young blade loafing about the kitchen with his pipe in his mouth, while the young girl who has promised to be or who has already become "his woman" uncomplainingly tugs in two pails of water at a time from the distant spring, brings in the coal and the wood, tends the cows and the garden-patch and, of course, does the housework. Perhaps the women of the Straits, who also work outdoors at the fisheries and are a hardy and healthy type, would resent any modernization of ideas, but the "Grenfell girls" and the doctors are setting them a new example.

It was 5 o'clock and we were due at Flower Cove at 6:30; but we had to collect some *Statice* and the turfy slopes about the little rock-crests were brilliantly rosy-purple with *Hedysarum alpinum* L., *Epilobium latifolium* L. and an *Oxytropis*. It took time to dig and clean these but at 5:45 we quit, wondering whether we could possibly cover the four miles of ledgy and peaty path and have time to get out of our seal-skin Straits boots (made after the Esquimaux or "Huskimaw"

fashion) and flannel shirts and be dressed to go out to tea in forty-five minutes. But Long called a halt! From the deep crevices at the crest he was extracting a strange Crucifer and Parson and Mrs. Richards would have to forgive our tardiness—for any species of the arctic genus *Braya* in this latitude is rare; in fact, we knew of only one species and this was something entirely distinct.

It was a great supper: delicious soup, lobster, hot rolls, delicate vegetables, cakes and preserves, and Mrs. Richards most tactfully hid her surprise at our ravenous appetities; but we were getting real "home food." The ordinary fare of the Newfoundland fisherman is calculated for a hardy race; but we were fresh from indoor and inactive city life and had found the great helpings of dough-balls, salt pork, boiled bones, leathery cabbage and dried peas a little overwhelming—plenty of calories but pretty hard on untrained digestions. To be sure, the people of the Straits, through the efforts of the Grenfell Mission, have learned to value lettuce and greens and Mrs. Whalen makes the most delicious of whole-wheat bread; and, as one of the big traders who supplies these ports told me, "the folks at Flower Cove are the most extravagant in the colony. They ain't willin' to live like their grandfathers. Why, we sell them more prunes and dried apricots and other luxuries like that than anywhere else in the colony." But the Newfoundland fisherman's dinner on Sunday, the day of puritanic inactivity (like that of week-days only more of it, with an ultimate plum pudding or currant duff) seems calculated to distend the stomach for the whole of the coming week[1]; and when, late in August, we left the island, we agreed that we should never again dare look a cabbage or a pig directly in the eye!

The signal at Point Amour, across the Straits, had sounded and everyone from Eddies Cove to Deadman's Cove knew that the "Glencoe," returning from Battle Harbor, had passed Forteau; so, when she appeared at the entrance to the harbor we were all ready to be taken out by the small boat to board her. Capt. Norman used to bring the "Home" up the narrow channel, with barely room to turn, to the wharf; but Capt. Blanford, substituting with the much larger

[1] Changes come slowly in this region. The late A. S. Packard, landing on the opposite shore in 1860, wrote: "Accepting our hostess's kind invitation to take dinner, we sat down to a characteristic Labrador midday meal of dough balls swimming in a deep pot of grease with lumps of salt pork, without even potatoes or any dessert; nor did there seem to be any fresh fish. The staples are bread and salt pork; the luxuries game and fish; the delicacies an occasional mess of potatoes, brought down the St. Lawrence once a year in Fortin's trading schooner."—Packard, *The Labrador Coast*, 75 (1891).

and finer "Glencoe" (with a complement of 30–40 officers and men) was cautious and refused to risk the passage. We did not wish to leave the Straits but, naturally, we could not dodge the plain fact that we had come to Newfoundland to botanize about Trepassey at the opposite corner of the island, fully 350 miles to the southeast.

We left Flower Cove in the afternoon but a heavy wind was blowing and one of the officers informed us that the "Glencoe" "hadn't had a civil day the whole trip," and, when we put into the sheltered harbor of St. Barbe, it was decided to tie up at the wharf there, hoping the wind would go down with the sun. So, promptly after supper, while some of the officers went trouting up one of the brooks, we started a botanical reconnaissance of St. Barbe Bay. There were only three or four hours of daylight, but they were enough for us to pick up a few things we had not been seeing: *Poa trivialis* L., here, as elsewhere in Newfoundland, native of spring-heads and rills, *Botrychium virginianum* var. *laurentianum* Butters, with heavier and coarser sterile fronds than ours, and *Osmorhiza obtusa* (C. & R.) Fern., which Miss Priest had collected at Flower Cove; and we extended slightly southward the ranges of a few species.

Shortly before daylight we roused slightly as the "Glencoe" left St. Barbe and almost before we were asleep again we were wide awake, puzzled by the grinding noise under our stateroom and a terrific list from which the ship did not recover. It took no time to get on deck and to see that the splendid "Glencoe" was hard aground on a submerged ledge near the Dog Peninsula or "Dog Pen"; and those who knew that we had begun our trip with a train-wreck were inclined to look upon us as hoodoos. We did not confide to them, that our consciences still whispered that we were being further punished for abandoning southeastern for northwestern Newfoundland. All attempts to drag the steamer off by means of anchors and cables set at various angles proved futile, and toward night, as a gale was springing up with a prospect of seriously racking the "Glencoe," all passengers were taken in life-boats to the nearest settlement, Brig Bay. It is no small matter for a fishing community of half a dozen families to house thirty-five or forty half-ship-wrecked people suddenly thrust upon them, especially since, as they all said on this coast, "there are no fish; so what's the use of going out for them?" But they rose to the situation and tucked us all away and they had at least plenty of bread and butter and tea. On this diet we had less "pep" than if we had

been able to get some fresh fish or even some smoked caplin (the dog's food in winter); but we had an interest which kept us fully occupied and, since we hoped never again to be marooned at Brig Bay (after the first night we called it Bug Bay), we seized the opportunity to collect every plant of interest there and we ate every wild berry within a radius of a mile.

On the upper border of the beach, in dry limestone-shingle, there was a strange grass, in habit like *Poa alpina* L., but more densely tufted and with tiny panicles, the European *P. alpina* var. *frigida* (Gaudin) Reichenb. On the limy rock-barrens and in the adjacent swamps we were able to extend southward the ranges of several species, including *Carex microglochin* and *Gentiana propinqua;* and we here established new northern limits for *Carex sterilis* Willd., *C. Hostiana* var. *laurentiana* Fern. & Wieg., *Parnassia parviflora* DC., *Scutellaria epilobiifolia* Ar. Hamilt. and *Antennaria straminea* Fern. The two "Plumboys," *Rubus arcticus* and *R. acaulis*, were both fruiting and we were much interested in making a comparison of the two, the former with coarse drupelets and large stones, the latter with more numerous and smaller drupelets and stones and a rich flavor, superior to that of any of our other raspberries. *Arenaria cylindrocarpa* Fern. was in the mixed clay and limestone gravel, creeping extensively among the stones and throwing up at irregular intervals moss-like tufts of short leafy branchlets with terminal olive-brown capsules; and most of the more generally distributed specialties of northwestern Newfoundland abounded: *Carex glacialis, Salix reticulata* and *vestita, Betula microphylla* Bunge, *Comandra Richardsiana* Fern., *Draba incana* L., *Epilobium glandulosum* Lehm.; and *Gentiana nesophila*, the largest plants we have ever seen, 2.3 dm. high, with flowers 5 cm. long, likewise the tiniest, 2 cm. high, with fully mature flowers only 1.2 cm. long, a range of variation which defies the maker of an artificial key.

So we kept fully occupied until Thursday evening when, at about 6 o'clock, the "Prospero" arrived from the northeast side of the island, quickly pulled the "Glencoe" off the ledge and as quickly steamed away; and when we saw our steamer again afloat and anchored off Plum Point, we stranded passengers chartered the motor-boats of Brig Bay and promptly returned to the "Glencoe." The crew were not really ready for us and we immediately transferred much of the fresh paint from the retouched railings to our overcoats, but that was a minor matter compared with being back again on board and it did not

greatly disturb us that Capt. Blanford decided to tie up for the night at Plum Point. And next day, when the wind increased, Long, Dunbar and I spent our time ashore, searching the neighborhood of Plum Point for further specialties. The wind kept up all night and, since three of the four compartments of the steamer were full of water, we lingered on and the young people of all the neighboring settlements from Derby's Tickle to Bird Cove gathered for a dance on deck.

Toward morning the water became "civil" and we steamed slowly but steadily on to spend the next night tied up to the wharf at Port Saunders. When we went ashore after supper we started over the road toward Pointe Riche, where Wiegand had collected some good calciphiles in 1910. Naturally, we did not expect to get any novelties on an evening stroll over the route he had formerly covered by daylight, but the charm of the open country, the sand-dunes with a northern colony of *Ammophila breviligulata* Fern. and other dune types, the turfy and rocky limestone barrens, and the great river-like spring breaking abruptly out of the rock-terrace at Sandy Cove will never be forgotten. We made the personal acquaintance of *Tanacetum huronense* var. *terrae-novae*, with whitish feathery foliage and large solitary or paired golden buttons. At the big spring was an extensive colony of *Taraxacum latilobum* DC., an endemic species of Newfoundland originally collected by La Pylaie, perhaps at this very spot, which he must have passed in 1820 when he botanized from Port Saunders to Pointe Riche. And we extended southward the Newfoundland range of *Gentiana propinqua*, extended northward the range of *Euphrasia americana* Wettst. and brought in from a bit of boggy woods a collection of the Asiatic *Epilobium palustre* var. *mandjuricum* Hausskn., a plant not recorded from America.

When we reached Curling on August 11, our little diversion "over just one trip" had occupied twenty days, and when we reached St. John's at midnight of Wednesday, the 13th, we were nearly four weeks late. The train for Trepassey would not leave until Friday noon, so, after a rainy morning, we spent Thursday afternoon climbing the slopes of South Hill. I had been there with Wiegand in 1911, but Long and Dunbar had not, and I was quite willing to linger with them over the "Sweet Hurts" (Blueberries, *Vaccinium pensylvanicum*) "Ground Hurts" (*V. uliginosum*) and "English Blackberries" (*Rubus canadensis*) which we had missed on the Straits; and particularly over

the Atlantic European specialties. *Pedicularis sylvatica* L., with small fern-like foliage and little racemes of exquisite shell-pink large corollas, and *Potentilla procumbens* Sibth., resembling our *P. pumila* Poir., but coarser and with very heavy and deep roots, abounded in the peat and rock along the hillside rills; the coarse *Pedicularis palustris* L., with long spike-like wands of rosy-pink and deep violet flowers, filled many boggy or springy swales along Waterford River. The Heath Grass, *Sieglingia decumbens* (L.) Bernh., remotely suggesting *Danthonia*, formed dense tussocks along with the delicate *Agrostis canina*. The unique *Juncus bulbosus*, related to our coastal plain *J. militaris* Bigel., but delicate and sprawling, bordered spring-pools, the inflorescenses often proliferous and bearing long plumes of foliage. And in spruce thickets at the top of the hill, as in the boggy swales along Waterford River and in spruce woods northward toward Torbay, where Wiegand and I got it in 1911, were closely repent carpets of a *Veronica*, in foliage suggesting *Linnaea borealis*, but related to *V. officinalis*, with more delicate racemes of blue-violet, rather than lilac flowers. This plant, although characteristic of mossy swales and spruce woods of the Avalon Peninsula and collected by Wiegand and me in 1911, and also indigenous in woodlands and recent clearings on Prince Edward Island, has not heretofore been recognized as an American. It is identical with specimens from Scotland, Ireland and Wales but unlike most material of *V. officinalis* from continental Europe. Its exact identity is still to be worked out.

In our limited time I was unable to take Long and Dunbar to some of the other Atlantic European plants which are also indigenous in southeastern Newfoundland, such as Mat Grass, *Nardus stricta*, and *Ranunculus hederaceus* and *R. Flammula;* and, except for the few species above noted, the flora of South Hill was meagre and uninteresting. The city of St. John's, likewise, is not very alluring to the stranger whose interest is not fishy, thoroughly a sea-faring town, with squalor, long rows of unpainted or only anciently painted houses, pervading odors of fish, cod-oil, seal-oil and the other maritime smells, and such hotel facilities as do not tempt the fastidious stranger to linger; so that we were glad when it was time for the train to start on Friday noon for Trepassey.

From the car-windows we were able to distinguish *Pedicularis palustris* and *P. sylvatica* and to extend their known ranges southward at least to Petty Harbor; and we were fascinated by the big bare hills

which guard the entrance to Bay Bulls. From time to time we "spotted" areas which certainly need investigation, such, for instance, as the stretch of shallow ponds and lakes south of Tor's Cove, and again in the area between milepost 34 and Caplin Bay, where we clearly saw the southern *Juncus militaris*, a species preëminently characteristic of Nova Scotia, Cape Cod, Long Island and the New Jersey Pine Barrens; and, since many of the coastal plain plants (including *Juncus militaris*) which are found on the barrens of the Exploits or about Notre Dame Bay, had never been known from the Avalon Peninsula, we naturally longed for a day in each of these areas. And as we passed Caplin Bay, Ferryland and Renews, all reputed localities for *Calluna vulgaris*, we strained our eyes in trying to detect the Heather.

The soil was right, the highly silicious Avalonian rock, hopelessly barren and desolate, with great stretches of "haith" or "mesh," but from the train we saw only the most uninteresting of plants, which are dominant on sterile areas of many sections of northeastern America: Cinnamon Fern, *Osmunda cinnamomea* L., Pasture Juniper, *Juniperus communis* var. *montana* Ait., White Top, *Danthonia spicata* (L.) Beauv., Rusty Cotton Grass, *Eriophorum virginicum* L., Hoary Willow, *Salix humilis* Marsh., Sweet Gale, *Myrica Gale* L., White Cinquefoil, *Potentilla tridentata* Ait., Fire Cherry, *Prunus pensylvanica* L. f., Indian Tea, *Ledum groenlandicum* Oeder, Lambkill, *Kalmia angustifolia* L., and the ubiquitous *Solidago uniligulata* (DC.) Porter and *Aster radula* Ait. After we had vainly tried for three hours to force enthusiasm over these and other sure indicators of soil-sterility, someone in the seat behind me remarked, "I vote for the Straits Coast," to which came the unparliamentary but sincere response, "I second the motion." And, when we had passed Cappahayden and the Red Hills and turned westward across the Rocky Moor, the anticlimax after coming from the half-hourly botanical thrills of the Straits was still more depressing; miles and miles of hopelessly barren rock-pasture, with no plants in sight more exciting than *Potentilla tridentata*, *Agrostis hyemalis* (Walt.) BSP. and *Empetrum nigrum*, and with signs of animal occupation only when a flock of beautiful brown and white Willow Ptarmigan swiftly flew away from the passing train. Dunbar, whose home is in Hancock County, Maine, where we supposed there were boulders enough, expressed the thoughts of all three of us by remarking, "The more we turn westward

toward home the farther away we seem to get!" while a Newfoundlander on the train explained to me that this is the "abomination of desolation" referred to by the prophet Daniel.

Toward twilight, after passing Portugal Cove, we came out on the shore of Biscay Bay and in a few minutes reached Trepassey, at the head of Trepassey Bay. Following the good advice of the conductor on the train we found a comfortable home with Mrs. Isaac Curtis and, after a late supper, retired with the words of Cormack's century-old label of *Calluna vulgaris* vividly in mind: "Trepassey Bay also very abundant, S.E. of Newfoundland, considerable tracts of it."

Next morning we were out bright and early and were surprised to see what an apparently prosperous town we were in; but our interest being in the rocky, gravelly and peaty barrens which stretch north and east from Trepassey Bay, we got away as promptly as possible from the settlement. During a very long day we worked across the barrens eastward to Biscay Bay and it was 10 in the evening when we got in. Nowhere had we seen *Calluna*, though "Blackberry," *Empetrum nigrum*, in some of its forms had repeatedly deceived us; and, when we told Mrs. Curtis and others of our disappointment, they were in no way surprised, for the people of Trepassey are mostly of Irish or Scotch extraction, many of them very intelligent, and they had never seen nor heard of Heather outside the "old country." In fact, the station agent, who proved to be a widely read man, assured us that in his Newfoundland travels Cormack had never been within many miles of Trepassey and any statement he had made about the region must have been based on hearsay.

Nevertheless, Trepassey has some interesting plants. At gravelly brooksides, in peaty and rocky barrens and around spring-heads with *Stellaria uliginosa* Murr., *Ranunculus reptans* L. and other such plants, was a very characteristic *Galium*, quite strange to us, but upon study proving to be the Heath Bedstraw, *G. saxatile* L. of western Europe, where, just as at Trepassey, it grows "On barren heaths and commons, and in upland pastures, borders of woods, and on rocks."[1] The European *Juncus bulbosus* abounded in some of the pools, European *Glyceria fluitans* was in the swales, and near Portugal Cove we got immature or sterile *Potamogeton polygonifolius*, a European species already well known from the region west of St. John's. Otherwise the indigenous flora of the barrens about Trepassey was made

[1] Engl. Bot. ed. Syme, iv. 219 (1873).

up of the species which probably occur through the whole breadth of southern Newfoundland from Cape Ray to Cape Race, including such typical coastal plain plants as *Schizaea pusilla*, *Lycopodium inundatum* var. *Bigelovii*, *Carex trisperma* var. *Billingsii* Knight, *Habenaria blephariglottis*, *Amelanchier stolonifera* Wiegand, *Rubus recurvicaulis* Blanchard ("English Blackberry"), *Gaylussacia dumosa* var. *Bigeloviana* Fern., and *Bartonia paniculata* var. *iodandra* (Robinson) Fern. *Carex umbellata* Schkuhr, which grew in silicious gravel, we had previously had only from central Newfoundland, and a little species of "Good-bye-Summer," with short elliptic or oval leaves, seemed strange to us, a plant afterward found all the way to Cape Ray, the endemic *Epilobium Pylaieanum* Fern. And a common weed of the hayfields, along with French Sorrel, *Rumex Acetosa* L., was the Cow Parsnip of Europe, *Heracleum Sphondylium* L., here called "Wild Parsnip," and considered a vile nuisance because of the rank flavor it imparts to the milk. As a matter of fact the plant, closely related to the indigenous *H. lanatum* Michx., might be made a boon to the region in spring and early summer when first sprouting. The new stems and leaf-stalks of the American species, boiled in salted water, are a good substitute for stewed celery and the European species is probably quite as good. Here is the verdict of Boswell Syme: "The young shoots and leaves may be boiled and eaten as a green vegetable, and when just sprouting from the ground resemble asparagus in flavour. This experiment is, however, seldom tried, owing to the ignorance of those to whom such an addition to the table would be a benefit and luxury." [1]

After our extremely long Saturday we were slow to get up on Sunday, particularly as it rained and we had all contracted "devil's grip," a particularly debilitating infection which was running through the region. We were, consequently, not specially enthusiastic about putting up the extensive collections of the day before, but by night they were all in press. As we planned to go from St. John's to Bonaventure to search for Cormack's *Arbutus Unedo*, it was necessary for us to return to St. John's from Trepassey on Monday morning. But during the trip back our physical condition and our experience of Saturday with one of Cormack's records influenced us to modify the plan. We knew that the rocky hills at Bay Bulls looked interesting, there was a well recommended small hotel there and the trip to Bona-

[1] Engl. Bot. ed. Syme, iv. 155 (1873).

venture and back would kill nearly a week, so we decided to stop off at Bay Bulls, at least to see what the region was like.

Mrs. Williams's little hotel proved to be what we had not seen since Mrs. Billard's at Port aux Basques, a comfortable place with juicy roasts, plenty of vegetables and good milk and, in our weakened condition, we settled right down and promptly dismissed Bonaventure from the programme. The region was of the hopelessly sterile silicious Avalonian rock, as elsewhere from St. John's to Cape Race and Trepassey, and the flora was not specially different. Several of the Atlantic European plants which we had seen on South Hill but not at Trepassey were here: *Sieglingia decumbens*, *Agrostis canina*, *Carex leporina* L., *C. Oederi* Retz. and the little variety of *Veronica officinalis;* and in the turf on the high hill[1] at the northern entrance to the harbor the American *Carex umbellata* and *C. novae-angliae* Schwein., both very rare in Newfoundland, grew with *Sieglinga;* while in boggy swales the European Manna Grass, *Glyceria fluitans*, and typical European *Carex muricata* L. (*C. stellulata* Good.)[2] abounded with *Epilobium nesophilum* Fern., endemic to Newfoundland and the Magdalen Islands. But on the whole the region was a disappointment and we again went through our formula: "I vote for the Straits Coast," followed by "I second the motion!"

It was now time to start home and, since we were all averse to the tedious and, as we knew from experience, dangerous return across the island by rail, we decided to go by steamer from Argentia along the south shore of the island to Port aux Basques and, incidentally, to see a new strip of coast. The "Portia" would not sail until Tuesday so, rather than wait over in St. John's, we went Sunday afternoon, August 24, to Whitbourne, there to await the boat-train of Tuesday. Whitbourne is an old botanical center; Robinson and Schrenk collecting there in 1894, Wiegand and I in 1911 and Williamson in 1912. Consequently, we expected to get nothing new but we should at least be in the open country. Our expectations were in the main fulfilled, but our time at Whitbourne was interestingly occupied in botanizing two of the sand-bottomed ponds, where we collected again the specialties of the region: *Thelypteris palustris* Schmidel, *Isoëtes Tuckermani*

[1] On our labels we called this Joan Plains Hill, the nearest name we could hit upon from the pronunciation. When we inquired the name of the hill and finally asked the spelling we received the cryptic reply: "'How do you spell it?' My land! Here I've lived in Bay Bulls thirty-five years and I never heard a question like that. 'How do you spell it?' My land!"

[2] See Mackenzie, Bull. Torr. Bot. Cl. l. 346 (1923).

A. Br., *Sparganium americanum* Nutt., *Sagittaria graminea* Michx., *Elatine minima* (Nutt.) Fisch. & Meyer, *Sium suave* Walt. and *Gratiola aurea* Muhl., all common enough northeastward to Nova Scotia but rare in Newfoundland. But our chief interest was in securing an abundance of heavily fruiting *Littorella americana* Fern., a very rare species which is little known in fruit. Wiegand and I got good flowering material in 1911 but in 1924 the plant formed a close and often continuous fruiting turf along one margin of Goose Pond and we amused ourselves cutting thin sections of the turf and fingering out the fine gravel from the sod; but even now, nearly two years later, bits of gravel still rattle out in the herbarium.

The "Portia" was due to sail from Argentia Tuesday, but when we got there she was still loading, so we put in the afternoon exploring the sandy flats and brackish pools, not too far away from the wharf. There we got *Salicornia europaea* var. *prostrata* (Pall.) Fern., which we had known in Newfoundland only from Bay St. George; and, best of all, there were *Suaeda Richii* Fern., a characteristic species of eastern New England and adjacent Nova Scotia but not previously found in Newfoundland, and the more widely dispersed *Tillaea aquatica* L., also new to the island.

When we got back to supper a gale was blowing and the "Portia" was destined to stay at the dock overnight. In the morning, Long and I attempted further explorations but were nearly blown over a headland and returned, constantly fighting the wind, to spend the rest of the day working over our presses and watching the loading of a freight-car with silver ore from the mine at Argentia, now starting to the smelter at Swansea in Wales. We were riding out the tropical hurricane which, we afterward learned, had been destroying shipping, houses and trees all the way from the South Atlantic States to southern Newfoundland and, after passing through a train-wreck and the grounding of a steamer, we had no wish for the *tertium quid*, so we approved the wisdom of the captain in taking no chances. By night the wind had quieted and we put across Placentia Bay. It was a clear and brilliant evening, the "Portia" confidently took the magnificent swell and all hands gathered on deck to watch the breakers dash, often more than one hundred feet, over the cliffs; but finally the deck grew too wet and everyone disappeared inside. Long and Dunbar sought our stateroom, but I was content to stop at the first lounge in the upper cabin; there was more air and the deck-rail was conveniently near.

By morning we were at Burin and during the day, as we passed between Lamaline and the French islands of St. Pierre et Miquelon and entered Fortune Bay, our minds were constantly on Bachelot de la Pylaie, who more than a century ago lived at St. Pierre and botanized this coast and the hills back of it, and we naturally wondered again and again where he had found *Calluna* and just which of "les points culminans produisent . . . le *Hudsonia ericoides*." But we got no chance to investigate; the "Portia" attended strictly to business and made only the shortest of stops at small ports where botanizing might be possible, but tied up for hours at the large towns, like Grand Bank, where botanizing was out of the question. At Harbor Breton the wharf was sufficiently near natural and unspoiled open country for us to make a dash, and we brought back from a fresh pool *Limosella aquatica* L., a characteristic plant of Europe and western America but in eastern America heretofore known only from the southeastern corner of the Labrador Peninsula.[1] The great rock walls about Gaultois, Rencontre, Francois, La Poile and Rose Blanche were fascinating, and we yearned to get ashore long enough to give them a full examination; and, in the region back of Burgeo great white sandy hills attained almost montane height and a sportsman who came aboard told us that these sandhills extend many miles into the interior. It consequently required but little exercise of the imagination to picture La Pylaie and perhaps Despreaux and other companions crossing over from St. Pierre and here ascending "les points culminans" on carpets of *Calluna*, *Corema* and *Hudsonia*, and in the wetter spots gathering *Carex remota*, *Juncus acutiflorus* and *J. scirpoides*, the sight of any of which would thrill the modern student of the Newfoundland flora. But we had to be content merely with snatching a few species at each landing, mostly the ordinary types of any granitic region from Maine to Labrador; and, when we reached Port aux Basques on Sunday in time for the "Kyle" homeward bound, we had seen enough of southeastern and southern Newfoundland so that, when one of us feelingly remarked, "I vote for the Straits Coast," the others as feelingly responded, "We second the motion!"

(To be continued.)

[1] See Fernald, Rhodora, xx. 160 (1918).

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND

M. L. Fernald

(*Continued from page 87*)

Part II. Journal of the Summer of 1925

(Plates 153–155)

We did not have to draft a party to botanize the Straits Coast of Newfoundland in 1925. Long and I already knew the endless possibilities of the region; Wiegand, who had been with me on two of my five trips to the island, was ready to return; Ludlow Griscom had tested western Newfoundland, from Bay St. George to Bay of Islands, and had seen the coast farther north and, consequently, needed no urging to join the party for his July vacation; and Stanley Pease, who had been with me on two early trips to Gaspé, with Long and me in Nova Scotia and with Griscom and me on the Mt. Logan trip of 1923, was ready to go also for July. I was fortunate in securing aid from the Milton Fund for Research at Harvard and Wiegand had a similar grant from Cornell; so we were able to take two student-assistants. Dunbar, unfortunately, was unable to go, so I selected Frank A. Gilbert, Jr. and Wiegand took Neil Hotchkiss.

Long and I had estimated, after our experience of 1924, that simply to touch the flora of the Long Range and of the West Coast would require 10 expert collectors 50 years of close botanizing, since our experience coincided with Wiegand's and mine in 1910 and with Mackenzie's and Griscom's, that practically every cranny has an isolated or endemic specialty. Already Curtiss and Lunt (1912) had got a few of the specialties of the Cod Roy region; Mackenzie and Griscom had taken the cream of the flora of Cape St. George; LaPylaie and

many others had botanized the head of Bay St. George; three parties had been on Table Mountain at Port-à-Port; many parties had done the simplest and most obvious things about the Bay of Islands; three parties had already looked at the easiest mountains of Bonne Bay; Wiegand had had a few days at Cow Head; La Pylaie and our earlier parties had sampled the shore of Ingornachoix Bay and we had very slightly sampled the southwestern shore of the Straits. But when the sharp-edged tablelands with their V-shaped gulches, forming a vast range 300–350 miles long and perhaps 15 miles broad, were taken into account and when we saw from the steamer most interesting areas of foreland and islands quite unknown to the botanist, the little excursions already made into western Newfoundland seemed very little indeed and we had visions of our party of 1925 penetrating in pairs or trios many untouched mountain-ravines.

But north of St. Paul's Inlet the Long Range recedes from the coast and gradually becomes visible only as a distant range of hills; and its only considerable spur approaching the coast north of Parsons Pond is on St. John Bay where the Highlands of St. John, with long east-and-west axes, present steep limestone escarpments, rising 1900 feet from the Gulf, the South Summit of the charts locally known as Doctor Hill, the North Summit as Bard Harbor Hill. North of that are lower wooded ridges, but from St. Margaret's Bay to the Straits the whole coastal region is essentially flat.

All being fresh from sedentary city life, we had planned, before undertaking a strenuous campaign in the unmapped mountains, with the necessary heavy packing and the endless tugging through pucker-brush, to harden ourselves by botanizing a few days in the level region near Flower Cove. So, after spending the forenoon unpacking and organizing at Mrs. Whalen's (Aunt Eliza's), where we had practically the whole house, including a fine kitchen-range for drying our paper, we started out on Friday afternoon, July 10, for our first collecting of the summer in the immediate neighborhood. The season had been very backward, flocks of icebergs lingered in the Straits and the spring-flowering species were just out, many willows, violets (*Viola nephrophylla* Greene and *V. labradorica* Schrank), "Wild Hyacinth" (*Smilacina trifolia*, deliciously fragrant) and the various Drabas (*Draba incana* L., *rupestris* R. Br., *hirta* L. and *megasperma* Fern. & Knowlt.) and Saxifrages (*Saxifraga oppositifolia*, *aizoides*, *Aizoon* and *caespitosa*).

In groups of two, three or four we scoured the country for four days, eastward to Sandy Cove, southward to Ice Point in St. Barbe Bay and as far as a mile from the shore back of Savage Cove. The specialties which Long, Dunbar and I had got in 1924 were, of course, still interesting, particularly as we could now secure in anthesis species formerly collected in fruit; and Long and I were a bit chagrined by the number of conspicuous plants now making a brave show, which we had previously quite overlooked. Practically all turfy or springy areas were white with the arctic cress, *Cardamine pratensis* var. *angustifolia* Hook., which we had never known from south of northernmost Labrador,[1] or golden-yellow with mats of the arctic-alpine *Potentilla alpestris* Hall. f., a species of the European alps, Greenland and northern Labrador which Wiegand had got in fruit on Pointe Riche in 1910 and Mackenzie and Griscom had found on Cape St. George. So abundant did it eventually prove to be wherever we went, eastward to Cape Bauld, southward to St. John's Island, that it easily takes rank as one of the common species of northwestern Newfoundland. *Carex bicolor*, too, which was so very rare the year before, soon became a sort of joke, for it was brought in by every party and proved to be of general range, though always somewhat localized, in wet depressions or along rills in the limestone gravel eastward to Pistolet Bay and south to Ingornachoix Bay; and *Comandra Richardsiana* Fern., which in 1924 was practically all sterile, was flowering profusely and was everywhere characteristic of peaty knolls in the tundra or of turfy borders of limestone gravel-barrens. The "chunky" little variety of *Habenaria viridis*, which Miss Priest had found, proved to be dominant and growing by thousands, especially on turfy or peaty borders of beaches or on turfy slopes near the sea, always associated with extreme boreal species. We began collecting a series in all stages from bud to fruit and we gradually extended the range of the plant eastward to Pistolet Bay. A detailed study subsequently shows that in its technical characters this common plant of northern Newfoundland is exactly intermediate between true *H. viridis* of Europe and the eastern American and eastern Asiatic *H. bracteata* Muhl. and that outside Newfoundland it is found from Bering Strait southward along the Rocky Mountains. It will be further discussed in Part III.

Another orchid which promptly challenged attention was *Habenaria*

[1] See Fernald, Rhodora, xxii. 14 (1920).

obtusata (Pursh) Richardson. This ordinarily unvarying plant of mossy woods was very variable along the Straits, the most characteristic extreme being a plant with crowded flowers and a yellowish tone, thus suggesting *H. clavellata* (Michx.) Spreng., instead of having the loose raceme and green color of the wide-ranging *H. obtusata*. We consequently devoted much attention to this series and it has been necessary to set off as a variety the plant with crowded racemes; and in the course of this study it has become apparent that one of the rarest orchids of Europe, the little plant of Finmark in arctic Scandinavia, which, since its discovery nearly a century ago by Blytt, has there passed as *H. obtusata*, is a very distinct, but heretofore unrecognized species.

On a visit to the Rock Marsh, Griscom, Gilbert and I found the little orchid known in America as *Malaxis monophyllos* (L.) Sw. or *Microstylis monophyllos* (L.) Lindl. so abundant in a springy swale that it would have been possible to collect many thousands of specimens. When we first came across the plant, in Newfoundland confined to the limestones of the West Coast, it was only in bud, but later in the season a good series in flower was secured, including occasional individuals with two leaves instead of the conventional solitary one. And the most interesting thing about it is that, when the plants are carefully studied, although they are quite like the plant of continental eastern America, they stand out from the Eurasian *Malaxis monophyllos* on practically every character. Most significant is the fact that the Eurasian plant has the flowers resupinate or up-side-down, so that the lip points up; while in the plant of eastern America the flowers are in normal position, with drooping lip. Asa Gray recognized this difference in 1835 when he described the American species as *Microstylis brachypoda*. Subsequent students of the orchids seem never to have compared the flowers of these plants, and for ninety years Gray's youthful discovery has been quite overlooked; even the name, which appears in *Index Kewensis*, being ignored in Ames's *Enumeration of the Orchids of the United States and Canada* (1924). The characters of the two species will be further elucidated in Part III.

One party, then another, proceeded to find in the dryish tundra a Coral-root which was perplexing—and very tantalizing, since it was always found as a solitary individual or in one case, when Pease and Griscom brought it in from the tundra back of Big Brook, as two plants. It did not look like *Corallorrhiza trifida* Chatelain, the small

early-flowering species found generally over Newfoundland and across Canada and the northern States. *C. trifida* in the flowering condition is yellowish or yellowish-green, its flowers yellowish or merely with purple-tipped sepals and with a white lip, which is without coloring except for a few somewhat indefinite basal spots of purple, and the column is strongly bent forward. The plant which was troubling us had more purple; the stem and the basal sheaths purple-tinged, the sepals purple or brown, these and the petals broader and blunter than in *C. trifida;* the lip larger and with long rows of purple dots below the marginal notches; and the column was more erect. Bachelot de la Pylaie, in describing his botanizing trip in 1816 into the interior of northern Newfoundland, back of Havre du Croc (Croc Harbor), referred to "Le *Corallorhiza occidentalis* N[obis]. voisin de *l'Halleri.*"[1] *C. Halleri* is a later name for *C. trifida,* so that La Pylaie was doubtless finding the same plant which, more than a century later, was puzzling us. La Pylaie's name was accompanied by no description and consequently has no nomenclatorial status. The rare plant of the tundra of northern Newfoundland is, however, a very close match for the beautiful plate accompanying the original description of the Scandinavian *C. ericetorum* Drejer in Flora Danica, xiv. fasc xl. 7, t. *MMCCCLXIV* (1843). In Europe, *C. ericetorum* is treated as a variety of *C. trifida,* as *C. innata* R. Br., var. *ericetorum* (Drej.) Reichenb. f. Ic. Fl. Germ. xiii. 160, t. 139, figs. I and II (1851), *C. innata* R. Br. being a long-used but later name for *C. trifida.* From our field-experience with the two we are not yet clear whether it should be merged with *C. trifida* or maintained as a species. The three collections, of four specimens, brought in seemed wholly distinct; and we can only hope that some other season the plant may flower in such quantity as to give us a good series.

But these preliminary days of hardening in the neighborhood of Flower Cove were not devoted primarily to the orchids. The willows were in perfection of flowering and we were able to get for the first time good staminate material of *Salix calcicola;* and a number of other willows were new to us or at least to the known flora of Newfoundland. Sunday, after the conventional heavy dinner, Griscom and I started for a brisk non-botanical walk to Sandy Cove and back. We adhered very faithfully to the non-botanical programme, but at Sandy Cove I could not resist the temptation to look on the rocky

[1] La Pylaie, *Voyage a l'Ile de Terre-Neuve,* 86 (1825).

crest for the *Braya* which, a year before, Long had discovered there in fruit. It was now in full bloom, with large white petals tinged outside with blue-violet; and later in the season we found it in profusion on the gravel- and rock-barren of Savage Point and in less abundance on Yankee Point. When Long first found a few over-ripe specimens in 1924 and thus made us all late to Mrs. Richards' supper, I called it *B. purpurascens* (R. Br.) Bunge, a wide-ranging arctic species; but now, with a splendid series in all stages from bud to ripe fruit, it stands apart as a perfectly distinct species with which it is only right to associate the name of its discoverer; for, if there is a keener collector or discoverer of rare and local plants than Bayard Long, I have yet to meet him.

We were having such superlative success that already the exploration of the Long Range to the south was being pushed forward to an indefinite future; and Griscom, remembering that from earliest boyhood he had had a yearning to stand on Cape Norman, called attention to the fact that Howley's geological map showed that the rock of the eastern end of the Straits, from Pistolet Bay, just beyond Cape Norman, eastward was "serpentine, etc." The serpentine barrens of Mt. Albert in Gaspé and of Blomidon on the Bay of Islands, as well as the serpentines about Bonne Bay, are all famous for their rare and localized or endemic species and, consequently, the infection rapidly spread and we all yearned to stand as promptly as possible on Cape Norman and to explore the serpentine barrens which we pictured as occurring just beyond. So arrangements were made with "Lo" Whalen to start by motor-boat as soon as possible after Sunday for Cook Harbor (or Brandy Harbor), just beyond Cape Norman, on Pistolet Bay. Monday and Tuesday, however, there was a northeast storm and, assured that no small boat could live on the Straits, we continued local collecting and on Tuesday three parties went out.

Long and I tried our luck on the barrens a mile back of Savage Cove, Griscom and Pease walked strenuously eastward to Payne's (pronounced Pine's) Cove, and Wiegand, Gilbert and Hotchkiss proceeded by motor-boat with Lo Whalen along the sheltered west coast as far as Ice Point. Long and I had plenty to occupy us. *Taraxacum* was in full flower and it was more than obvious that we did not at all understand the indigenous species and must collect good series of specimens; and *Salix* was in a similar plight. In making our way around one large pond in the limestone-barren we found our-

selves struggling through a thicket of a coarse willow suggesting the common *Salix discolor* Muhl. of more southern latitudes. But this shrub of Savage Cove had its long black-scaled caterpillar-like aments on elongate leafy-bracted peduncles and expanding with the leaves,—surely not *S. discolor* which is a "pussy willow," with aments sessile and expanding long before the leaves. The affinity of the large shrub with long-peduncled aments is not quite clear. In some characters it belongs with *S. discolor*, in others it is nearer the European *S. phylicifolia* L. and its American representative, *S. planifolia* Pursh; but it is clearly a new species, an addition to the already extensive list of Newfoundland endemics. At another point, where an ice-cold rill entered a pond, there was an extensive "salicetum," with the beautiful *S. myrtillifolia* Anderss. with lustrous dark-green closely crenulate leaves, the Rocky Mountain *S. Bebbiana* var. *perrostrata* (Rydb.) Schneider (new to Newfoundland) and a third species, a handsome large shrub with foliage as white as in *S. candida* but with quite distinct habit and with very long styles, *S. cryptodonta* Fernald, which had been known only from the type-region on the Humber, 150 miles to the south.

When we at last got through the belt of scrub-spruce and bog-ponds and came to the deeply shattered rock-pavement (plate 153, fig. 2) of the limestone barren, which is apparently an eastward extension of the Rock Marsh, we had thrill after thrill. The Yellow Lady's Slipper colored the peaty borders of the barren with hundreds or perhaps thousands of fully expanded flowers. We had previously had it from limestone barrens farther south and even from the highest point of Newfoundland, the summit of Lewis Hills; when we got back to the house Wiegand's party had also brought in a collection of it; and during the following week we saw it in profusion with arctic-alpine plants on many of the barrens eastward to Pistolet Bay. We were impressed by its few leaves and especially by its consistently short, broad and flat purplish petals; the Newfoundland plant, in the thousands of individuals we saw, rarely showing any tendency to the elongate curling petals of continental *Cypripedium parviflorum* Salisb. In fact, the larger specimens are, in their broad flat petals, so like some plates of the European *C. Calceolus* L. that, without examination of the staminodium, one would as quickly place them with the European as with the American species. In the form of its staminodium the plant of the Newfoundland limestones is somewhat dif-

ferent from either but, as I suggest in the more detailed discussion of the plant in Part III, it may well be that *C. Calceolus, C. parviflorum* and the plant of unglaciated areas of western Newfoundland are geographic phases of one circumpolar type.

The damp gravelly pockets were full of *Antennaria cana,* which we had all seen for the first time this season on Savage Point the day before but here much more abundant and from now on to be found everywhere eastward along the Straits; and equally abundant was a small pink-flowered *Braya* with pilose pods, obviously quite different from the larger white-flowered plant with glabrous pods which we had been getting. This made a third species of this arctic-alpine genus for western Newfoundland and when we got back we found that Wiegand's party had been collecting the same thing on Ice Point and during the succeeding weeks we found it general in limestone gravel all the way to Pistolet Bay. It proves to be the plant collected by Drummond on the Rocky Mountains of Alberta and described by Hooker as *B. alpina* β. *americana.* It is certainly rare in Alberta, the only material I have seen being some collected by the late Stewardson Brown, perhaps at Drummond's own station. But the extensive series from northwestern Newfoundland clearly demonstrates that it is a species quite distinct from *B. alpina* Sternb. & Hoppe of the European alps and likewise distinct from *B. siliquosa* Bunge, the Siberian species to which Schulz[1] refers *B. alpina* β. *americana.*

A turfy and bushy island on the rock-barren was the home of a beautiful *Arnica,* thousands of sterile plants; but this was evidently an off year, for we could get barely a dozen individuals which showed any sign of flowering. *Arnica* in Newfoundland had heretofore been known only from the region of Port-à-Port Bay and Cape St. George: *A. chionopappa* Fernald, *A. pulchella* Fernald and *A. terrae-novae* Fernald. This was a very large but not specially exuberant colony of *A. terrae-novae* and its discovery merely started the season, for from now on almost every different area explored, from Ha-Ha Mountain on the east to St. John's Island at the southwest, yielded its own peculiar *Arnica* as well as its *Antennaria, Taraxacum* and *Euphrasia.* In the wetter mossy pockets we spied some stiff bronze or purplish racemes, fruiting plants of the arctic *Pedicularis flammea* L., already known from the Shickshocks but new to Newfoundland. Wiegand's party had gleaned the best plants from Deadman's Cove, Anchor

[1] O. E. Schulz in Engler, Pflanzenr. iv[105], 231 (1924).

Point and Ice Point, extensions southward of many of our good finds, including the most southern colony yet known of the pink-flowered *Braya*, and northern extensions of *Antennaria straminea* and of *A. albicans* Fernald, the latter previously known only from Table Mt., Port-à-Port Bay; and Griscom and Pease, who had gone merely to stretch their legs, brought in a bunch of the beautiful rosy-pink *Orchis rotundifolia* Pursh, which colored the wet barren near Shoal Cove, another species new to Newfoundland, since the old record in Hooker's *Flora Boreali-Americana*, Dr. S. F. Blake informs me, was based on material of *Habenaria obtusata*. They also had splendid clumps of the European *Poa alpina* var. *frigida* which Long, Dunbar and I had added to the North American flora in 1924.

Wednesday, the 15th, started in as a "civil" day, so, as soon as we could get the presses filled with ventilators and stacked as near as we dared to the kitchen-range, we loaded Lo's boat with presses, paper, food, sleeping bags, etc. and headed down the Straits for Cook Harbor. In the eighteen miles from Flower Cove to Eddies Cove there are shelters or good harbors every mile or two and, of course, fishing colonies of considerable size. Then, beyond Eddies Cove, for sixteen miles to Big Brook, comes the Long Straight Coast, with no shelters for boats, a cliff-wall comparatively low at the west, but at "the Highlands" reaching an altitude of about 100 feet. A small boat caught there by a storm is completely at the mercy of the waves and cliffs; consequently the Straits fishermen have learned never to try the trip between Eddies Cove and Big Brook, Boat Harbor or Cook Harbor except on quiet water. During the late forenoon as we chugged along this coast, with endless fascinating limestone barrens, wild cliffs (the haunts of innumerable shore birds) and occasional waterfalls, we longed to get ashore to explore; but it was necessary to make all speed northeastward while the water was good. Soon after noon, however, the sea had become a little rough; our boat was too small for its load and the captain announced that nothing could make him go beyond Big Brook (where he had cousins). So Big Brook it had to be. But if we had not put in there we should perhaps never have known Tom Diamond and his good wife. Tom Diamond is one of the best known characters on the Straits, the friend of everyone from "the Harbor" (Flower Cove) to Brandy Harbor, a red-headed giant brim-full of Gaelic or Celtic good-humor, and picturesque in his fishing clothes; his back hair clipped short, his front hair unbarbered,

and a long forelock projecting from under his cap and flapping about his face to brush away the flies. He and his brother are the only settlers on this cove; they want no one else, for there would be too much crowding of cod-traps.

The wind was increasing and there were three or four hours to supper-time, so we all started botanizing; Wiegand, Gilbert and Hotchkiss eastward along the shore, Pease and Griscom to "the Highlands" three or four miles to the east, and Long and I straight back to the south. The cliffs forming the escarpment back from the shore were a fascinating alpine garden but covered mostly with luxuriant colonies of species we already had. Here, however, was the big-flowered woolly *Cerastium alpinum* var. *lanatum* which was new to us, and here were new troubles in *Poa, Salix* and *Cochlearia.* But leaving the escarpment, which properly belonged to Wiegand's assignment, Long and I went back over the crest. Here were many of the good things of Flower Cove and Savage Cove—the pink-flowered *Braya, Pedicularis flammea, Potentilla alpestris*, etc., and, for the first time north of Port-à-Port Bay, the unique *Antennaria eucosma* Fern. & Wieg., with blackish heads and erect spear-like white leaves. But, naturally, we were looking for novelties and we were not at all disappointed. The peaty border of a pool had a low cotton grass which looked unfamiliar, much lower and stiffer than *Eriophorum opacum,* which abounds along the Straits, and, since I had once made a revision of the American species of *Eriophorum,* but did not know this one, we were greatly excited. Subsequently we collected it eastward to Pistolet Bay and westward to Savage Cove and, as I have already shown,[1] it proves to be the true *E. callitrix* Cham., the rarest of Old World cotton grasses, heretofore known only from the type-region, St. Lawrence Bay on the west side of Bering Straits. With *Eriophorum callitrix* were the very rare *Carex capitata* L., new to Newfoundland, and a pretty *Primula* with non-farinose leaves, deep-crimson flowers and purple-tinged scapes, a plant we afterward found in better development at the margin of Big Brook, thence eastward to Pistolet Bay. This proves to be *P. sibirica* Jacq., var. *arctica* Pax, heretofore reported only from Kamtchatka and arctic Europe, but represented in the Gray Herbarium from the Canadian Rockies as well. The Alpine Bearberry on the knolls attracted us by its unusually thin and only slightly rugose leaves and a little investigation

[1] Fernald, Rhodora, xxvii. 205 (1925).

showed that we were getting *Arctostaphylos rubra* (Rehder & Wilson) Fernald, the species with bright-red berries, known from limestones of Siberia, China, the Canadian Rocky Mountains, Anticosti and the Mingan Islands but not previously from Newfoundland, although its occurrence there was wholly to be expected[1]; but, now that we had "spotted it," it was found everywhere, eastward to Burnt Cape, where the berries were ripe, and westward to Yankee Point. Its berries are smaller, thinner-skinned and much earlier to ripen than the purple-black berries of *A. alpina*.

Returning for supper, we found that the official time at Big Brook was slower than at Eddies Cove, and so much slower than that at Flower Cove, by which our watches had been set, that we still had an hour for another turn, so we headed for the mouth of Big Brook. There we were joined by Wiegand and his group and we all set to work collecting a fine series of *Primula sibirica* var. *arctica* and then turned our attention to *Epilobium Drummondii* Hausskn., a characteristic Rocky Mountain species, known in eastern America only from the Torngat Mountains of northern Labrador and from the Shickshocks in Gaspé. In the thicket of *Salix cordifolia* and *S. calcicola* there was a strange *Hieracium*, still very immature and mentally noted to be remembered on the next call at Big Brook, but the most shaggily villous species we had ever met. When we got back to the house Griscom and Pease had come in from "the Highlands" with many of the same species we had all been getting, including a fine lot of *Carex capitata* and a very densely matted *Asplenium* with almost leathery fronds. It proves to be nothing but *A. viride* Huds., but along the Straits it forms turf so dense and firm that it takes vigorous cutting to get out chunks of the sod; and the fronds, growing in almost full exposure to the sea-fogs and winds, are so tough that the carpet can be walked upon without being seriously injured.

It took all the evening to put up our material and, after a good night on our air-mattresses, we awoke to find the sea still dark and choppy, offering no immediate hope of our rounding Boat Harbor Point. So we sought new areas to explore. Griscom and Pease, as usual, were given the "long-legged" assignment, this time to go as far into the interior as possible; Long and Gilbert crossed Big Brook and worked around the shore westward to Mile Brook; and Wiegand, Hotchkiss and I headed eastward toward Lower Cove. All three

[1] See Fernald, Mem. Am. Acad. xv. 314 (1925).

parties brought in better material of *Antennaria eucosma* and collections of *Tanacetum huronense* var. *terrae-novae*, which was now making conspicuous carpets of white plumes with occasional large gold buttons in the turfy slopes all along the Straits. Our party became much absorbed in *Taraxacum*, *Cochlearia* and *Draba;* and in the turf some rods back from the beach we found great carpets, now in full bloom, of the "Sea Purslane," *Arenaria peploides* var. *diffusa*, much smaller and with less rigid branches than in var. *robusta* Fern. of the New England strands. Another plant which greatly pleased us was *Carex Deweyana* Schwein. This species is common in Canada and the northern States, but its status in Newfoundland was doubtful. There was an unverified record from Bay St. George, and Griscom and I had got a cow-bitten young sprig of it near Savage Cove; but here at Big Brook it was abundant, along with arctic types. We tried to make it something better, but it proves to be very characteristic *C. Deweyana*. On the high limestone cliffs near "the Highlands" there was a strange prostrate willow, resembling the arctic *S. anglorum* Cham. but differing from it and from its known southern varieties (of the serpentine mountains of Bonne Bay and Bay of Islands and the serpentine Mt. Albert in Gaspé) in its much smaller leaves, its very short aments and its tiny capsules, only 3 or 4 mm. long, another Newfoundland endemic, later found on Cape Norman and to the west toward Eddies Cove.

The other two parties brought in full boxes. Both of them had plenty of *Orchis rotundifolia* and of *Lesquerella arctica* (Wormskj.) Wats., the latter a silvery rosette-plant with golden flowers and plump fruits, already known from the southwest coast and, now that it had begun to show, soon found to be generally distributed in limestone gravels from Burnt Cape in Pistolet Bay south to St. John Bay, thence, as our earlier collections show, to Bay St. George. Griscom and Pease also displayed a collection of a tiny *Epilobium*, hardly in flower but, with its basal rosette, remote linear leaves and few flowers, clearly *E. davuricum* Fisch., new to Newfoundland and one of the rarest of species, heretofore represented in the Gray Herbarium by only a few poor bits; but now, after the season is closed, illustrated by full sheets, collected all along the northwest side of Newfoundland, from Cap Dégrat to St. John's Island. After supper the water was quiet and Tom Diamond said that we could easily make Cook Harbor in three hours, but he had reckoned without our skipper. Lo had

renewed his fund of conversation at Big Brook and when we rounded the point and came abreast of Boat Harbor (where he had more cousins) we suddenly headed in. Upon our protesting that we were going to Cook Harbor we were given the alternative of going in to Boat Harbor for the night or being landed on the nearest shore, to hunt for another boat. This was unpleasant but we were helpless under existing circumstances; so Boat Harbor it was. The two households of Woodwards, who form a clan-like colony at Boat Harbor, took us in for the night and it was toward 11 o'clock before we had visited enough to be allowed to retire. About 2 A.M., after a three-hour struggle with "scarlet runners" (*Cimex*), we heard Lo's voice from down stairs, "Mr. Fernald, it's a clever morning." When we came down, everyone was about and at the day's occupations; the men had gone out to the cod-traps, the women were getting breakfast; and by 6 o'clock we had rounded Cape Norman, a great bare limestone wall with fantastically weathered strata, and were actually heading into Cook Harbor. A chance to spread our mattresses on the floor was secured at Skipper John Decker's and, after discharging our cargo, we put across the bay to the nearest point which Howley's map indicated as "serpentine, etc."

In the brilliant morning light Burnt Cape, separating Pistolet Bay from Ha-Ha Bay, was purplish or reddish-brown, and, encouraged by the geological map, we expected soon to be on a second, though small, Mt. Albert or Blomidon. Gradually, however, as we neared Burnt Cape, the reddish-brown color so characteristic of the weathered serpentine barrens of Gaspé and Newfoundland faded and when we came close under the Cape it had assumed a very familiar slate-gray tone, the color of most Silurian limestones of Newfoundland. That it was not serpentine was altogether too obvious and we could see no distinction between this and the limestone we had left the night before at Big Brook. Landing at a sheltered point on the east side of the Cape, toward Raleigh (pronounced Rally), we told Lo to come back for us at 2 P.M. It was now 9 o'clock and, since we had so obviously been fooled as to the character of the rock, we could certainly get all that was worth while from it and eat our lunches in five hours.

Griscom, Pease and Hotchkiss were to work northward around the tip of the Cape, and the rest of the party started due west to make a sort of cross-section. In two minutes the shouting began. "*Carex concinna*." "Yes, we're getting it too, and the queer *Asplenium*."

"Here's *Polystichum Lonchitis.*" "What's the other *Carex?*" "What's the *Habenaria?*" And so on until the parties were out of hearing. *Carex concinna* R. Br. had only once been found in Newfoundland and then very little of it, on Cape St. George. *Polystichum Lonchitis* is frequent on the West Coast but we had not met it before this season. The "other" *Carex* proves to be true *C. livida* (Wahlenb.) Willd., a rare and poorly understood plant of northern Europe and Alberta, here found for the first time in eastern America.[1] The *Habenaria* was a very distinct plant with slender greenish-yellow spiciform racemes, emitting a delicious fragrance of vanilla, the lip three-toothed, clearly the plant which I had very recently received from Greenland as *Habenaria albida* (L.) R. Br., now found for the first time in North America. The plant abounded in damp glades and on open peaty slopes where Long, Gilbert and I had become anchored and where we spent much of the forenoon, but it must be somewhat localized, for, when Griscom (who had an eye open particularly for orchids), Pease and Hotchkiss joined us in the afternoon, they had seen nothing of the sort. Subsequently they got plenty of it, on Cook Point or on Cape Norman and later in the month we stretched its range to the western end of the Straits. *Habenaria albida* of continental Europe is appropriately named for its tiny whitish flowers. The flowers of our plant no one would intentionally call white; they are stramineous and much larger than in *H. albida*, and in details they show many departures from it, and it seems very clear that the plant of the Faroe Islands, Iceland and Greenland, which has passed as *H. albida*, is a separate species, now found in profusion in northwestern Newfoundland.

Wiegand had got beyond reach, so that we now had at least three different parties out and, when Griscom and Pease appeared at 1 o'clock, Hotchkiss was separated from them. In this way the northern half of Burnt Cape got a preliminary searching. Long and I, having learned from many experiences the importance of raking the ground for the less obvious species, initiated Gilbert into this art, bending over or crouching and creeping gnome-like over the grayish or whitish angular gravel. At first we should have said that there were absolutely no plants there, but our eyes were soon accustomed to the neutral color, and tufts of *Festuca supina* Schur, the tiny *Poa alpina* var. *brevifolia* Gaudin of the Swiss Alps, new to North America

[1] See Fernald, RHODORA, XXVIII. 5 (1926).

and very distinct with its distichous blunt leaves only a centimeter or so long, *Carex glacialis*, *Antennaria cana*, *Lesquerella arctica* and other canescent or cinerous species began to appear. Thus we spent the late forenoon and very soon we were getting a singular little gray *Potentilla*, with deeply lacerate leaflets and tiny cream-colored petals. In the field I took it to be the arctic *P. pulchella* R. Br., but it proves to be very different in many details; and after a study of the three monographs, of Lehmann, Wolf and Rydberg, and the critical notes on arctic species by Simmons and others, and an examination with Dr. Rydberg of the species of this affinity, it becomes apparent that Burnt Cape has an endemic species of *Potentilla*. Further up the slope Wiegand was collecting *Antennaria*—the third and fourth species from Burnt Cape, and there we came upon a veritable garden of *Orchis rotundifolia*, the pink flowers making a vague lilac color as seen from a long distance away. In a bushy glade we found a colony of *Epilobium alpinum* L. (*E. anagallidifolium* Lam.), common enough on the Tabletop Mts., Gaspé, but new to Newfoundland.

When the scattered members of the party assembled at the crest there was some delay over *Arnica terrae-novae* and *A. chionopappa;* and I was picking from the crevices a *Taraxacum* which, in its small blackish involucres, was unlike anything we had seen before. Griscom and Pease, as already stated, had lost Hotchkiss, but he was now in sight. They had, of course, many of our good things, and two more Antennarias; but they were specially excited over a strange *Oxytropis* with deep violet corollas and reflexed fruits, and no wonder! It was *O. foliolosa* Hook., described from the mountains of Alberta but now known very locally southward to the high mountains of Colorado, here found for the first time in the East. We had landed on Burnt Cape with grave doubt, disappointed that it was not serpentine, but now that it approached 2 o'clock and we had planned to look at Ha-Ha Point, it was necessary to abandon the most thrilling spot thus far found. So, reluctantly, we descended the slope to the waiting motor-boat. When we got back to the belt of gravel where the new *Potentilla* grew, Long began to direct his eyes and nose into the gravel and he soon held up *Crepis nana!* *Crepis nana* Richardson is one of the characteristic plants of the cordilleran region of North America, otherwise known only on the Arctic coast of America, on the Altai of Siberia and on the Torngats of northern Labrador; but here it was on Burnt Cape, and, true to form, Long was holding up the

procession by finding a "thriller" after it was time to quit. No one objected, however, and we all fell on our hands and knees and crawled over the gravel until we had sufficient material so that our herbaria could each have a bit; but there are no duplicates for distribution, for *Crepis nana* is either the rarest plant of Burnt Cape or we did not find its real home. Farther down the slope, near the upper border of the beach, we could not pass without collecting *Astragalus alpinus* L. and *A. eucosmus* Robinson. We already knew them from Newfoundland but these were the first specimens (though by no means the last) for 1925.

Crossing Ha-Ha Bay, we landed at the base of Ha-Ha Mountain (plate 153, fig. 1), a ragged trap bluff only a few hundred feet high but fantastic in its irregularity, the unplaned rock-spurs projecting at various angles and indicating a lack of glacial scouring. We could spare only an hour, so every minute counted. Griscom and Pease tackled a steep chimney and promptly came upon the tiny gray *Draba nivalis* Lilj. of the Arctic and the Shickshock Mts., but new to Newfoundland, and *Ranunculus pedatifidus* var. *leiocarpus* (Trautv.) Fern. (*R. affinis* R. Br.), another Arctic species, heretofore unknown south of the Torngat region. It occurs on precipitous walls where Long (plate 153, fig. 3) insisted on climbing for some on a later trip. Griscom and Pease also added to the fast growing series of *Taraxacum* and I was particularly delighted to have them bring back the big *Oxytropis campestris* var. *johannensis* Fern., the plant so characteristic of gravels along the St. John River in Maine and New Brunswick. At the foot of the steep slope we were getting another plant which greatly pleased me, *Streptopus oreopolus* Fern. which is so characteristic of subalpine meadows in the Shickshock Mts. of Gaspé and which we had supposed to be endemic to that area. And the springy meadow at the foot of the slope was a sight never to be forgotten, a blaze of orange, white, violet and pink in great masses, with three species of *Taraxacum*, *Cerastium alpinum* var. *lanatum*, *Arabis alpina*, *Astragalus eucosmus*, *Iris setosa* var. *canadensis*, *Hedysarum alpinum*, *Epilobium latifolium* and dozens of others, with the flexuous blackish tops of *Carex atratiformis* nodding everywhere and strange willows forming large clumps still in flower, at least two of them new to science.

It was hard to leave, but we must get back to Cook Harbor for supper. Our boxes were jammed tight-full; we had scarcely slept the

night before and had breakfasted at daybreak and it would be midnight before we could get the specimens into paper. So, although we knew that there was plenty more to do on Ha-Ha Mountain and Ha-Ha Point, just as there was on Burnt Cape, we had to be satisfied. And on the whole we ought to be. When we finally dropped to sleep our day had been twenty-two hours long and we knew that we had practically all the Antennarias of Western Newfoundland, *A. eucosma*, *A. cana*, *A. straminea*, *A. albicans* and *A. spathulata* Fernald; and *A. spathulata* var. *continentis* Fern. & St. John, a plant previously known only from the Labrador; and we had collected at least twenty-five species new to Newfoundland, including a number new to science, others new to America, others the first time east of the Rockies and others the first time except in Gaspé, Anticosti or northern New Brunswick and northern Maine. In the current idiom, that was *some* day!

Saturday our presses kept us busy until noon. We did not have driers enough and it required special pains to keep the specimens from sweating and darkening. When we sat down to dinner Hotchkiss was missing. But he soon came in from a short stroll back of the village, with a bouquet of the vanilla-scented *Habenaria* and a bronzy-purple plant with velvety purple-black flowers, quite new to us but obviously the arctic *Bartsia alpina* L. Mrs. Decker and her daughter could not appreciate our enthusiasm, for "Velvet Bells" (*Bartsia*) was a common plant in their experience and the yellowish-green "Smell Bottle" (*Habenaria*) was likewise an old story; but we hurried through dinner and got out as soon as possible. Long and Pease were to be landed on Schooner (or Brandy) Island; Wiegand, Griscom and Hotchkiss were to be taken to Cape Norman, and Gilbert and I were to spend the afternoon on Cook Point, back of Cook Harbor.

Many of the good things of Burnt Cape were also on Cook Point, but we were not sufficiently hardened as to pass untouched *Habenaria viridis*, *Eriophorum callitrix*, *Carex bicolor*, *Primula sibirica* var. *arctica*, and other species which, a few days before had been so exciting. Another *Taraxacum*, *Arnica terrae-novae* again and, of course, *Bartsia alpina* absorbed much of our attention. Besides *Antennaria albicans* we got *A. vexillifera* Fernald, a species supposed to be endemic to the Shickshock Mts.; and, on the turfy upper margin of the strand of Norman Cove, Gilbert and I found a single individual of *Oxytropis foliolosa*. We began a long search for another but quite in vain; or,

at least, during the search we suddenly found ourselves in a dense carpet, like a lawn, of a repent *Astragalus*, the slender freely forking branches extensively creeping and bearing exquisite lilac flowers, some clustered at the tips of long capillary peduncles, some almost sessile in the axils. The plant was fascinating and quite strange and when we got back, late to supper, the rest of the party were inclined to jeer because we had so much of it. But the 34 full sheets (and 35 more with fruit, collected on a later trip) will all be in demand, for it is a beautiful new species of the west-American subgenus *Homalobus* and its nearest relative is the very local *Astragalus yukonis* Jones.

Both the other parties had been collecting the *Bartsia*, *Habenaria* "*albida*," and the usual series of choice but not novel species. Cape Norman had yielded very large material of the pink-flowered *Braya*, *Arnica pulchella* (the first time except on Table Mt., Port-à-Port) and some perplexing willows. And Long and Pease had found *Oxytropis foliolosa* on Schooner Island. They had a splendid collection of the most beautiful *Antennaria* yet collected of the *alpina*-series, a plant with unusually broad leaves and extraordinary large blackish heads; and just as they were hurrying to jump aboard the motor-boat for the return trip Long, again true to form, spied a strange *Cerastium* in a crevice and had barely time to snatch a single piece before the boat swashed away from the shore, *Cerastium Regelii* Ostenfeld, a rare species of arctic Eurasia with flowers much smaller than in *C. alpinum*, the short calyx-lobes rounded. We have only one small piece but, as Long says, "we at least know where to go for it in America." While waiting for Gilbert and me to come to supper the others had wandered along the shore at Cook Harbor and had gathered a quantity of *Hymenolobus procumbens* (L.) Nutt., new to us but already known from the Straits, the only region of eastern America where it grows.

Sunday morning the water was quiet and it seemed the part of wisdom to get our skipper and his boat headed around Cape Norman and turned toward home, so by 6 o'clock we were off. Griscom, skeptical, after our having used three days to make the "easy half-a-day's run" from Flower Cove to Cook Harbor, and wanting to get back promptly, walked; and he showed his wisdom for, as soon as Boat Harbor came in sight, the motor-boat was headed in and we knew that protest was useless. We must spend the day at Boat Harbor while the breeze had a chance to come up and ripple the water

and Lo freed himself of the new supply of gossip from Raleigh and Brandy Harbor. Promptly, when we touched at Woodward's wharf, Pease, Gilbert and Hotchkiss decided that they, too, would rather walk and so be certain of reaching Flower Cove in time for the next mail south, on Monday. That left Wiegand, Long and me; and, knowing from experience that there would be no hope of leaving before next morning, we tried to be philosophical and went botanizing. The list of plants would largely repeat that of the preceding days; but Boat Harbor yielded a few species which we had not seen. In a shallow pool to the west, toward Watts Bight, there was an aquatic grass just coming into bloom, clearly an *Alopecurus* but strange to us, the arctic plant which I have recently discussed, *A. aequalis* var. *natans* (Wahlenb.) Fern.[1], known outside the Arctic only at the Straits of Belle Isle.

After the heavy Sunday dinner we were glad of a good walk; so we went to the high ridge south of the harbor. In the scrub thicket *Vaccinium ovalifolium* Sm. was abundant, a species of Pacific America already known from western Newfoundland; and at one point we came upon a colony of *Sanicula marilandica* L., singularly out of place in this arctic-alpine flora. The gravel at the crest was thoroughly mixed and packed as if it had formed the bed of an ancient stream; and in this mixed gravel, with *Lesquerella arctica,* was a great colony of *Antennaria vexillifera,* which we had got on Cook Point the day before; and lower down, while collecting the now common pink-flowered *Braya,* Long found a single rosette or another species, the leaves covered with long, crisp white villosity. Seach for a full hour brought one more sterile plant to light. We need it in better condition but from the foliage alone it seems probable that it is *B. Richardsonii* (Rydb.) Fern. of the Canadian Rocky Mountains.

When we started early Monday morning there seemed no question that we should get to Flower Cove in a few hours. The water was calm and if we could but get past Big Brook there would be no place to visit before Eddies Cove and from there on we should be near home. Luckily, Tom Diamond was out at his traps so we stopped outside to exchange gossip and thus safely passed Big Brook. On the way down we had been impressed by some waterfalls coming off the barrens near 4-Mile Cove, and as the sea was now so very quiet we decided on the return to stop and look them over. They yielded nothing

[1] Fernald, Rhodora, xxvii. 198 (1925).

novel, however, but we collected the specialties of the place and in one depression in the gravel I found a *Carex* which did not look quite familiar. In the hurry of the moment, with the boat tossing in the surf waiting for us, I did not stop to examine it, but dug a few plants and went on; and, as is so often the case, I soon wished that I had had my wits about me and had taken a good supply. For the little plant, with mostly pistillate terminal spikes, superficially resembles the rare arctic *C. rufina* Drejer, but in its technical characters it belongs with *C. livida.* It has been described as *C. livida* var. *rufinaeformis* Fern.[1] but better (especially riper) material may show it to be a unique species.

This time the fates, themselves, took Lo's part. We had not got far beyond 4-Mile Cove when a squall struck us and for the next hour the little boat fought bravely through the rough sea. The splash was bad for our presses but, by stretching ourselves and our waterproof coats between them and the bow of the boat, we succeeded in fending off most of the water until we got into the shelter of Eddies Cove. So there we were, on shore again, destined to stay at Eddies Cove until the blow was over. After dinner the obvious thing to do was to go botanizing. Almost in Mrs. Coates's yard *Carex incurva* was making a carpet at the easternmost spot at which we got it. The boggy swales were full of *Carex chordorhiza* var. *sphagnophila* and *C. microglochin, Primula egaliksensis* and the other plants characteristic of swales at Flower Cove; but many openings in the spruce thicket were occupied by the Rocky Mountain *Epilobium Drummondii,* which we had first seen at Big Brook, now well developed and with the characteristic bulbs forming at the bases of the stems. We hoped to find many interesting things along Eddies Cove Brook, which at its mouth diffuses itself as a shallow stream or thin film over a broad expanse of rocky delta; but on the whole the flora there was Canadian rather than arctic, the most ordinary plants of thicket and swale; but in one pocket we did find *Viola palustris* L., a species new to Newfoundland but naturally to be expected, since it abounds in Gaspé and reaches the mountains of Maine and New Hampshire. It was scattered among the tall grasses and sedges and mostly past flowering, but we secured enough in anthesis to give us the delicious fragrance of *Viola odorata* L., a quality I had never before noticed in *V. palustris.*

[1] Fernald, Rhodora, xxviii. 7, 8 (1926).

When we came in to supper the wind was going down and after supper we packed up our things ready to make the two-hour trip home; but, no! Our employee ordered us to wait until morning. We were in his hands and obviously could not discharge him until we got back to Flower Cove; and on Tuesday morning when our motor-boat came up to the Whalen's wharf, the race was over and the pedestrians had won by 20 hours! They had the old presses cleared and the driers dried; and, after we had read our mail, everyone set to work putting our tremendous new collection through the presses. It was three days before some of the plants could get into ventilators; but by the second day, July 23, we felt it safe to take some local walks, for immediately in the neighborhood there would not be enough of novelty to embarrass us. Griscom, bent upon studying the birds of the comparatively sheltered thickets at Eddies Cove, had gone there; but the rest of us were still wholly botanists. In groups of two or three we retraversed the region from Sandy Cove to Bear Cove and after two such days it became clear that we had the area now pretty well in hand. We extended various ranges but added only a few species to the Newfoundland list. Two, however, are worth special record. In the thicket near Savage Cove there was a tall *Epilobium* with flowers much larger than in *E. Hornemanni* Reichenb. which abounded everywhere. The strange plant has the more pointed leaves with sharper teeth than in the latter species; and comparison shows it to be a perfect match for Alaskan material of *E. Behringianum* Hausskn., a species heretofore known only from southern Alaska, and, by way of the Aleutian Islands and Kamtchatka, southwestward to the Kurile Islands. The second plant was also an *Epilobium*. The pond at the border of the Rock Marsh, where *Agrostis melaleuca* and *Eriophorum Scheuchzeri* abound, has its southern shore bordered by an extensive limestone pavement which, during the spring thaw, is obviously a part of the pond-floor. There we got many interesting things and, failing to recognize one species, I mechanically took two or three individuals for examination. It is fortunate that I did so for it proves to be *Epilobium leptocarpum* Hausskn., var. (?) *Macounii* Trel., another cordilleran plant new to eastern America; and, as in the case of Long's *Cerastium Regelii*, we at least know where to go for more. Better than that, we know a second station, for in a few days we were collecting a full series along the trail up Bard Harbor Hill.

Our curiosity regarding the region of Cape Norman being tempor-

arily a little satisfied we now turned our minds to the Highlands of St. John and planned to take the "Home" south on the morning of Monday, the 27th, to St. John's Island, thence to cross by motor-boat to Bard Harbor on the mainland shore. This was the trip we had long dreamed of and it was consequently a shock and deep disappointment to the rest of us when Griscom and Pease announced that they must start home by that boat. We could hardly accuse them of dreading an ascent on a trail to 1900 feet, for Pease's mountaineering exploits are too well known, and I had personally seen Griscom add a sick packer's load to his own and carry them both at once up the steep slope into Fernald Basin in the Shickshocks. So we were forced to accept the inevitable and leave them on the "Home" when we reached St. John's Island. Mr. John Haliburton, with whom we had arranged to get put across to the mainland, was away but Miss Haliburton insisted on our staying to dinner and then some of the men took us across nine miles to Bard Harbor.

Bard Harbor has two families, those of Eli Galton and his son-in-law, Caleb Chambers, in summer and a third family in winter; and three or four miles to the south, at the mouth of Doctor Brook, there is the Galliott family. The men were all away on the outer islands, but Mrs. Galton and Mrs. Chambers took good care of us. It was obviously too late, at 4 in the afternoon, to explore the hills, but the great limestone escarpments of both hills, Bard Harbor Hill to the north, Doctor Hill to the south, were pretty tempting, so we ventured to go a little way on the trail up Bard Harbor Hill. After crossing marshes the trail led through rich Canadian forest and clouds of mosquitoes and flies; and, perhaps largely to get away from the flies, we hurried up the slope. Slightly below timber-line we came to a steep glade, full of *Heracleum lanatum* Michx., *Polystichum Braunii* (Spenner) Fée and *Thelypteris Filix-mas* (L.) Nieuwl. and with so many thousands of the famous European snail, *Helix hortensis*, that, struggling up the wet slope and perpetually slipping back, we promptly dubbed the place "Helix Slide." Reaching the rocky summit we looked in vain for limestone. We were on a vast tableland of hopelessly sterile quartzite and tried to be enthusiastic over *Juncus trifidus* L., *Luzula spicata* (L.) DC., *Hierochloe alpina* (Sw.) R. & S. and the other ubiquitous plants of the most silicious mountain-crests. In one depression we did find *Carex stylosa*, which we had known only about Port aux Basques; and Hotchkiss, tugging through a scrub-

thicket, brought back from a glade material of *Milium effusum* L., a grass we had had only from the region of Ingornachoix Bay. But we were much depressed at the anticlimax, for the western escarpments of both hills certainly looked like limestone and the geological map so indicated them.

(*To be continued*)

NORTHWESTERN NEWFOUNDLAND

FIG. 1 (upper). Western spur of Ha-Ha Mountain. FIG. 2 (left). Weathered limestone rock-barren back of Savage Cove. FIG. 3 (right). Bayard Long collecting *Ranunculus pedatifidus* var. *leiocarpus* on Ha-Ha Mountain.

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND

M. L. Fernald

(*Continued from page 111*)

Next day we felt no enthusiasm to start through the flies up the trail again and it was almost noon when we crawled listlessly up "Helix Slide" to the rocks above. Wiegand, Gilbert and Hotchkiss

started northward, to get at the outer escarpments if possible; Long and I struck due east to see what might turn up. The tableland (plate 154, fig. 1) stretched for miles to the east and three or four miles back a saddle extended south, connecting there with the northern side of the west-to-east tableland of Doctor Hill. Everywhere the surface was shattered angular rock with only the rarest of small erratics, thus indicating only trivial glaciation. At first it looked as if our impression of the night before was completely justified, but when we got to the top of a dome a splendid prospect was before us. For miles the tableland stretched to the north, northeast and east toward the distant Bluey Hills and Hummocky Hills, but in the foreground, separating the dome we were on from a broad flat dome to the east and southeast ("the Plains of Waterloo" of the local guides, because of the "great slaughters" of caribou which used to occur there) there was a deep gorge (Deer Pond Gulch) descending from a high basin to the east (Deer Pond), its brook tumbling by cascades for perhaps a mile, then swinging abruptly southward through a cañon and disappearing in the direction of Doctor Brook. Hastening toward this gulch we were soon on carpets of *Phyllodoce caerulea* (L.) Bab., one of the rarest alpine plants of Newfoundland, and we soon came to a tributary stream (Mans Humbug) which dashed precipitately into Deer Pond Brook. The thicket was full of the Shickshock *Streptopus oreopolus*, which we had got on Ha-Ha Mountain and Schooner Island; and with *Vaccinium ovalifolium* was the equally abundant and very distinct *V. nubigenum* Fern., another species supposed to be endemic to the Shickshock Mountains. *Carex stylosa* was so abundant that we were soon indifferent to it; and, stopping to eat a hasty lunch, we pulled from the wet moss of the rill the arctic *Deschampsia atropurpurea* (Wahlenb.) Scheele, new to Newfoundland, and *Epilobium palustre* var. *lapponicum* Hausskn., which Haussknecht records from Labrador but which we had never seen. The mossy bed of Mans Humbug brook was covered by a dense and almost uninterrupted carpet of *Epilobium Hornemanni*, the individual clumps often a foot or more across and very beautiful with their thousands of flesh-pink flowers.

The dripping slopes of Deer Pond Gulch were carpeted with continuous turf of *Saxifraga rivularis* L., interspersed with *Arabis alpina* and various Poas, the Saxifrage gigantic for this species, 1.5 dm. high, with leaves often 2 cm. across. *Gnaphalium norvegicum* Gunn., with

wands of purple-black or bronze heads, one of the arctic-alpine specialties of the Shickshocks, and the arctic-alpine *Epilobium lactiflorum* Hausskn., also new to Newfoundland, soon appeared; and we were puzzled by the big green *Angelica* which massed itself along the brook. Collections made later in the season both here and on Cape Onion show it to be an undescribed species nearest related to *A. ampla* Nels. of the Rocky Mountains. The *Conioselinum* of the brook-side seems to be *C. Gmelini* (Bray) Steud. of arctic Europe; and the great clumps of finely cut fronds belonged to *Athyrium alpestre* (Hoppe) Rylands, var. *americanum* Butters, one of the rare alpine ferns of western North America, heretofore known in the East only from the Shickshock Mts. This was as satisfactory as we could ask for and at 5 o'clock, realizing that we had a long tramp back to the trail, we set a limit beyond which we must not ascend, a dripping wall with rills breaking out every few feet. The rills were full of a *Montia* and from its habitat we hoped that we had true *M. fontana* L., but, alas, it is nothing but the same old *M. lamprosperma* Cham. which abounds all along the coast; but there was no mistake about *Saxifraga stellaris* var. *comosa* Poir. This high-arctic plant, with an extreme southern station on Mt. Katahdin, here formed little rows at the crests of the dripping shelves and it took much manoeuvering to get it without precipitating ourselves into the gorge. But it is beautiful material, showing the greatest diversity of habit and size of bulblets and a system of stolons such as we had never imagined.

We positively had to quit, but our emotions had undergone a remarkable change since noon; and when, after sliding through the nettles (*Urtica* sp.?), *Epilobium boreale* Hausskn. (another Alaskan and Shickshock Mt. specialty new to Newfoundland) and *Helix hortensis* below timberline, we got back to the house at 10:30, our respect for Bard Harbor Hill was further increased. Wiegand's party had got to the base of the upper escarpment and had brought back *Asplenium viride*, *Cryptogramma Stelleri* (Gmel.) Prantl, *Salix vestita*, *Draba arabisans* Michx., *Saxifraga Aizoon*, *Potentilla nivea* L. and the other conventional lime-types; and, best of all, they had *Astragalus Blakei* Eggleston, new to Newfoundland, a species supposed to be endemic to cliffs of northern New England.

After getting the material all through the first run of driers and into fresh driers and ventilators, we crossed Thursday evening to St. John's Island, to be ready for the "Home," which was due on Friday,

and there we enjoyed the hospitality of Mr. Haliburton, who comes for the summer from Bonne Bay for the cod-fishing, and Miss Haliburton, who had come on from Boston for a vacation. Luckily for us, news trickled along the coast that on Friday morning the "Home" had not yet left Rocky Harbor. Consequently, from breakfast-time to early evening we had an opportunity to explore the southern end of St. John's Island, keeping always where we could see the smoke of the steamer when she passed Pointe Riche and went into Port au Choix, an hour's run from us. St. John's Island is 3 miles across, a great doming plain of horizontal limestone, wooded in spots, but with much of the area an open barren deeply mantled with the finest of angular gravel, so deep and undisturbed that, although, where the cliffs have been washed by the sea (plate 154, fig. 2), the talus has been removed, where they have not been touched by the sea, the talus has accumulated from the bases quite to the tops of the cliffs (plate 154, fig. 3)—a condition strongly contrasting with that in regions which were denuded of their weathered rock-mantle during the Wisconsin glaciation.

If St. John's Island had been our first landing place in western Newfoundland, our day there would rank with the spectacular visit to Burnt Cape. We saw only a small area, perhaps one-tenth of the island, but the array of good things in that small patch was amazing. Surely, all but the most blasé would find interest in a flora containing *Puccinellia coarctata* Fern. & Weath., *Carex bicolor, C. lepidocarpa* Tausch and *C. microglochin, Juncus albescens, Salix reticulata* and *arctophila, Rumex occidentalis, Lesquerella arctica, Potentilla alpestris, Epilobium davuricum, Primula egaliksensis, Gentiana nesophila* and *Senecio pauperculus* var. *firmus* Greenm. But these were not all. *Cochlearia, Draba, Euphrasia* and *Antennaria*, as usual, gave us new problems; we got one *Arnica* which had now become familiar, *A. chionopappa*, but from a turfy slope a mile away Wiegand brought in another which is certainly *A. Griscomi* Fern., the very distinct thick-leaved species of the Mt. Logan Range in Gaspé. *Artemisia borealis* Pall., which we had known in Newfoundland only from the Port-à-Port area, was abundant; *Agrostis paludosa* Scribn., a local species described from the north side of the Straits, was here; but, as in three of its stations on the Labrador, it belied its name and grew on the driest of barrens. In a springy run in the gravel we got a most singular *Carex*, which I take to be the European *C. Oederi* var.

subglobosa (Mielich.) Richter, a plant Wiegand had found on Pointe Riche in 1910. Thoroughly typical *Botrychium Lunaria* grew side-by-side with var. *onondagense* (Underw.) Clute. The former was healthy and green, the latter much dried-out or scorched, as if frost or a drying wind had injured it; in other words, as if the southern var. *onondagense* were more sensitive than the usually more boreal *B. Lunaria.* It was late for *Taraxacum* but in the deep rain-swashed gravel we found one tiny species, dead-ripe, with red achenes nearly 5 mm. long, resembling *T. ammophilum* Nels. of Wyoming but with corniculate involucral bracts, the stipe of the mature pappus barely longer than the achenes and the latter decidedly larger than in the Wyoming plant. Again, as on Burnt Cape, Ha-Ha Point and Bard Harbor Hill, we hated to leave when we were only just beginning to clear away the species already familiar to us and to find the endemics or the epibiotics[1]; but we promised ourselves another visit three weeks later, when we should come back for further exploration of the Highlands of St. John under the guidance of Caleb Chambers.

The next move was to the extreme eastern end of the Straits, with Quirpon and Cape Bauld as the ultimate objectives. Profiting by our mistake on the Cape Norman trip, we took the selection of a skipper and boat into our own hands; and, after hearing from several independent sources that "Al Rose has the best boat on the Straits and the skipper is as reliable as his boat," negotiations were opened; and on Tuesday, August 4, with Albert Rose at the engine and his brother, Rev. Mackinlay Rose (home for a vacation before going to Montreal for graduate study) at the stern, we started for our second trip down the Straits. There was no balking at wind and tide (in fact the wind was hailed with glee and a sail run up to reinforce the engine), and, after calling in at Big Brook to ask Mrs. Diamond for a hot dinner, we put in to Cook Harbor in the afternoon for gasoline (65c. per gallon), stopped for the night at the comfortable home of Isaac Warren, and next morning Wiegand, Gilbert and Hotchkiss landed at Raleigh to explore Piton Point, the head of Ha-Ha Bay and the shores of Isthmus Cove, south of Burnt Cape; and Long and I returned to Ha-Ha Point and Burnt Cape. Our object was, in part, to secure mature material of many of the species found before, but our parties brought in a few novelties: *Salix cryptodonta* from another

[1] "species which are the survivals of a lost flora—for these I propose the name *Epibiotics*, which signifies survivors"—H. N. Ridley, Journ. Bot. lxiii. 182 (1925).

station; *Lathyrus maritimus* var. *aleuticus* Greene, the arctic and subarctic extreme with capillary stems and small leaflets, the first south of Labrador; *Viola renifolia* Gray, new to Newfoundland; and gigantic *Arnica pulchella* from the slopes of Ha-Ha Mountain, known at Raleigh as "Sun Flower"; and, of course, a full quota of puzzling Euphrasias.

After spending Thursday forenoon putting up our specimens in the big storehouse of Thomas Elliott, whose hospitality we enjoyed at Raleigh, we started in the afternoon for Quirpon (now-a-days pronounced Kar-poon). Before we reached Cape Onion a solid blanket of fog enwrapped us and until we reached Jacques Cartier Island, at the entrance to Quirpon Harbor, we saw almost no sign of shore. Quirpon is really a summer camp of fishermen and boasts no hotel; but we were fortunate in being allowed to camp at the big "room" of Mr. H. G. Maddock of Carbonear, who, with his storekeeper and housekeeper, occupied a little three-room bungalow. There was scarcely space for all of us, so the boys, Al and Kin Rose, Gilbert and Hotchkiss, camped and cooked their meals on Mr. Maddock's schooner; and the "old men," Wiegand, Long and I, were sumptuously entertained at the bungalow. Quirpon was one of La Pylaie's stamping-grounds. North of the channel lies Quirpon Island with high trap and slate hills, the highest, Cap Dégrat, rising 505 feet, the northern point of the island being Cape Bauld. South of Quirpon the hills are almost as high; and we began at once a preliminary exploration back of Little Quirpon (the Maddock establishment), next day explored Quirpon Island and Saturday the hills toward Griguet ("Cricket").

When we left Saturday evening, with many hills necessarily still unexplored, we had at least a representative collection. Many of the calcicolous specialties which abound from Burnt Cape southwestward had dropped out, and the comparatively southern flora of eastern and central Newfoundland had made its way quite to the extreme northern tip of the island: *Isoëtes Tuckermani* A. Br., of southern New England, growing in a pool with the arctic *Sparganium hyperboreum* Laested. and the splendid *Eriophorum Chamissonis* var. *aquatile* (Norman) Fernald,[1] at its first known station outside arctic Scandinavia; *Potamogeton Oakesianus* Robbins of the Pine Barrens of New Jersey and of New England and the southern *Callitriche heterophylla* Pursh in pools bordered by *Juncus stygius* var. *americanus* Buchenau and

[1] Fernald. Rhodora, xxvii. 207 (1925).

Drosera anglica Hudson; and so on until we had new northern limits for *Glyceria nervata* var. *stricta* Scribn., *Carex tenuiflora* Wahlenb. (farther north in Europe, etc.), *Carex leptonervia* Fernald, *Betula Michauxii* Spach and *Empetrum Eamesii* Fern. & Wieg. *Hordeum boreale* Scribn. & Sm., known only from the North Pacific and Bering Sea region and the Straits of Belle Isle, was abundant; *Carex Halleri* Gunn., new to Newfoundland, was a dominant turf-plant with *C. stylosa;* and on the inner slope of Cap Dégrat a tall and stiffish brown-topped *Carex* was pretty clearly a new hybrid, of *C. atratiformis* and *C. Halleri.* On the springy slope back of Little Quirpon typical *Carex glareosa* Wahlenb., one of the rarest of plants, abounded; and by a brook slightly to the eastward the arctic *C. bipartita* All. (*C. Lachenalii* Schkuhr),[1] another species "new to Newfoundland," was in perfect development. On springy slopes both on the mainland and the island *Senecio pauciflorus* Pursh, another novelty, and *Barbarea orthoceras* Ledeb. were common with *Epilobium davuricum* and the ubiquitous *Alchemilla vulgaris* var. *filicaulis* (Buser) Fern. & Wieg. On the exposed crests of both mainland and island *Draba nivalis* hid in the gravel with *Carex glacialis;* on the top of Cap Dégrat we got *Saxifraga rivularis* and *Astragalus alpinus;* and in the thicket back of Little Quirpon the puzzling *Hieracium* of Big Brook, here in splendid development, a plant exactly matching material sent by Porsild from Greenland as *H. groenlandicum* Almq. It was obvious that La Pylaie did not exhaust the possibilities of Quirpon and equally obvious that we had merely got a glimpse of the region; but our schedule called for Sunday at Ship Cove in the lea of Cape Onion and after supper we moved westward to Cape Onion.

Ship Cove lies east of the tip of Cape Onion and opens upon Sacred Bay. We there had a splendid home with the family of Mr. and Mrs. Henry Decker and when it was time to leave on Wednesday morning we were as sorry to say good-bye to the Decker family as we were to leave Cape Onion. We had had fine botanizing, an intelligent home and delicious food, and in the evening, as we worked over our presses, we had greatly enjoyed the conversation and the limitless anecdotes of Mr. Decker. He is a born *raconteur,* enthusiastic, graphic and with a keen sense of humor; and we were inclined to let our evening work prolong itself unduly as we listened to his vivid accounts of the fights on this "treaty coast," when, years ago, the French fishermen attempted

[1] See Mackenzie, Bull. Torr. Bot. Cl. 1. 348 (1923).

to claim their treaty rights. We constantly wished that we had a phonograph to record these stirring tales and especially to catch the full charm of the Newfoundland fisherman's dialect. One simple item will give some idea of the latter: "Hit's a fonny t'ing about dese 'ere tonnerbolt. W'y, one o' dem feller 'e struck de church over 'ere to Karpoon; 'e busted t'ru de doe han' den 'e went right out de back o' 'e."

We had planned too much for our limited time and actually did not get to the tip of Cape Onion. On the exposed crests between there and Ship Cove the dwarf Euphrasias were perplexing, some probably referable to the White Mountain *Euphrasia Williamsii* Robinson, with chocolate-colored corollas, others as small but with greenish yellow corollas, and others pink or white. Our presses were already so full, from Isthmus Cove, Burnt Cape, Ha-Ha Point and the Quirpon region, that it was necessary to spend half our time simply catching up on drying; but Monday afternoon we crossed over to Great Sacred Island and got some good things, including *Salix myrtillifolia* var. *brachypoda* Fern. of Table Mt., Port-à-Port Bay, *Epilobium lactiflorum* and *Gnaphalium norvegicum;* and, new to Newfoundland, *Parnassia Kotzebuei* C. & S. On Tuesday, Wiegand, Long and I went to Anse aux Sauvages on the Pistolet Bay side of the Cape, where we had seen from the boat a promising cove with high talus and springy swales. In crossing the "mesh" from Sacred Bay we were interested in a *Carex* with long pendulous spikes. The material proves to be quite identical with authentic specimens of a hybrid of *C. aquatilis* and *C. salina* var. *pseudofilipendula* (Blytt) Kükenth. The latter extreme variety, recorded only from northern Norway, has been collected on the northern shore of the Straits (Blanc Sablon, 1910, *Fernald & Wiegand*, no. 2318) and in Gaspé (Cape Rosier, July 28, 1882, *J. Macoun*) and its presence in northern Newfoundland may safely be surmised. At one very wet stretch there was an abundance of *C. tenuiflora* and *C. vesicaria* var. *Racana* (Boott) Fern., the latter rare in Newfoundland. We were attracted to a dryish swale because of a *Hieracium*, but very promptly Long detected the arctic-alpine *Botrychium lanceolatum* (Gmel.) Ångstr. and then *B. matricariaefolium* A. Br., both new to Newfoundland.

But Anse aux Sauvages itself was the choice spot. It looked so full of possibilities that we realized at once that unless we ate them promptly we should soon forget about our lunches. So we sought a dry bank

and proceeded to sit down on *Arabis Drummondi* var. *connexa* (Greene) Fern., a Rocky Mountain plant which we had not had from Newfoundland; after that we wasted little time over lunch. The trap cliffs of Anse aux Sauvage are as fine as any on the coast, high and vertical, but with extensive talus and enough chimneys and pockets to support the best of species; and if we had come to them a few days sooner we should have counted this as one of the greatest localities, on account of *Draba nivalis*, *Ranunculus pedatifidus* var. *leiocarpus*, *Parnassia Kotzebuei*, *Carex Halleri*, and many of the other choice species. The springy swale at the bases of the cliffs is as rich and fascinating as that on Ha-Ha Point and the great specialty there is the Kamtchatkan *Stellaria florida* Fischer, which we had known in America only from the Shickshock Mountains.

One of the younger Deckers had shown us a piece of soapstone picked up at the "bottom" (what we should call the head) of Mauve or Noddy Bay, so when we left on Wednesday morning we proceeded to Mauve Bay, again hoping to find an outcrop of serpentine or, at least, of soapstone. But there was not enough to support a distinctive flora. On a springy slope at the head of the bay, however, we got two species new to the island: *Epilobium brevistylum* Barbey, the first time east of the Rockies, and *Galium Brandegei* Gray, another cordilleran species but already known in the East, in northern Maine and Gaspé. *Senecio pauciflorus* was abundant and on the slaty talus of Cape Raven it was accompanied by *Erigeron borealis* (Vierh.) Simmons, a species of arctic Norway and Greenland, which Dr. Huntsman had already collected at Quirpon Harbor. Stopping over at Cook Harbor and Cape Norman for more material of some of the specialties, we left the former place at 1.30 p.m. and, maintaining a steady rate of nine miles an hour and calling in to visit no cousins, were back at Flower Cove for supper.

Albert Rose could not take us on the next trip but, although this was a great disappointment to us, we were wholly satisfied, in fact quite delighted with our next skipper. Leaving Flower Cove with John Whalen and his motor-boat on Wednesday, August 19, we were at Bard Harbor in the early afternoon and, accompanied by him and by Caleb Chambers, as guide, had established a camp in Deer Pond Gulch by Thursday noon. Starting in where we had left off three weeks earlier, we explored Bard Harbor Hill for three days, from the Overfall of Deer Pond Brook on the south to Southwest Gulch on the

north and the foot of the upper escarpment on the west; and, when we came down Saturday night, we had at least ten additions to the Newfoundland flora: *Poa laxa* Haenke, *Carex lenticularis* var. *albi-montana* Dewey, *Salix herbacea* L. and two other willows (one of them described in Part III), *Cerastium cerastioides* (L.) Britton, *Sibbaldia procumbens* L., *Cassiope hypnoides* (L.) D. Don, *Veronica alpina* var. *unalascensis* C. & S., and a new species of *Lactuca* from the northern limit of the genus in eastern America. Not actually new to Newfoundland, but previously known from only one or a few stations were *Woodsia alpina* (Bolton) S. F. Gray, *W. glabella* R. Br., *Carex bipartita, Habenaria viridis* var. *bracteata* (Muhl.) Gray, *Oxyria digyna* (L.) Hill, *Arabis Drummondi* Gray, *Alchemilla vulgaris* var. *vestita* (Buser) Fern. & Wieg., *Galium kamtschaticum* Steller and *Solidago lepida* DC.; and we had materially extended northward the ranges of *Pteretis nodulosa* (Michx.) Nieuwl., *Osmunda Claytoniana* L. and *O. cinnamomea* L., *Nemopanthus mucronata* (L.) Trel., *Eupatorium maculatum* var. *foliosum* (Fern.) Wieg. and *Lactuca spicata* (Lam.) Hitchc. *Streptopus oreopolus*, which had never been known in fruit, was loaded with cherry-red slightly elongate berries; and *Vaccinium nubigenum* proved to have the richest and most grape-like fruit we had ever tasted in the genus, its near relative, *V. ovalifolium*, having berries of decidedly disagreeable flavor, known to Caleb Chambers as "Mathers." We had had a most interesting trip, and if we could have taken care of the specimens, should have stayed on to collect dozens of other novelties. And we had been greatly interested in the abundance among the broken rocks of the tableland of the Rock Ptarmigan, a bird which was new to us; and we were specially indebted for fresh meat to a weasel which lived about our camp, for the very first morning when we came out of our tents we found at our front door a fine big rabbit dead, but still warm, with a tell-tale incision at the throat. Another semi-botanical item, besides the luscious quality of the fruit of *Vaccinium nubigenum*, which interested us, was the smoking tobacco used by Chambers. We had noticed, whenever the wind wafted us a whiff from his pipe, a most unusual sweetish and rather fascinating fragrance. This, he explained, was from "Pitnagen" which he was smoking; and when he gathered some and brought it to us with the explanation that he had learned it from the famous Micmac guide, Mattie Mitchell, we recognized it as *Aster puniceus*, var. *oligocephalus* Fern. Probably the variety is not significant, and smokers may try any form of *A. puniceus*.

Doctor Hill, the southern mass of the Highlands of St. John has, near the northern end of its west wall, a very striking gash or chimney (plate 155, fig. 1) extending from the summit-tableland two-thirds the way down the precipitous escarpment and visible from a long distance. From the time Wiegand and I first saw this dripping chimney in 1910 we had felt that it must be a good place, but difficult to reach. We now learned that it was "John Kanes's Ladder," from the circumstance that that veracious gentleman, a pioneer in the region, claimed to have ascended the mountain by this precipitous route (plate 155, fig. 3). No one had done so since and when Long, Chambers and I started for it we had no intention of doing anything to take the lustre from John Kanes's glory. But botanically the western escarpment of Doctor Hill was a great place, and many days of further exploration there will be necessary to bring together all its relic and endemic species. Starting in at the base of the slope, a little to the south of Doctor Brook we promptly found *Equisetum pratense* Ehrh. and *Osmorhiza divaricata* Nutt., common enough in Gaspé but not recorded from Newfoundland; and in mossy glades in the woods, while following up puzzles in *Corallorhiza*, *Orobanche* and *Monotropa Hypopithys* L., we came upon fruiting *Calypso bulbosa* (L.) Oakes, very rare and scattered but new to Newfoundland. It was a long and tough pull through scrub-forest below the big escarpment (plate 155, fig. 2) and when we finally reached the calcareous talus it was mid-afternoon. We promptly condemned our own stupidity in not having brought blankets and food, for we had struck a rich alpine garden, full of the choice things of calcareous rock and talus, but mostly now familiar: *Woodsia alpina*, *Polystichum Lonchitis*, *Cryptogramma Stelleri*, *Draba rupestris*, *Parnassia Kotzebuei*, *Potentilla nivea* var. *macrophylla* Ser., *Oxytropis campestris* var. *johannensis*, unusually luxuriant (with leaves more than 2 dm. long), *Gentiana propinqua*, gigantic *Solidago multiradiata* Ait. (4.5 dm. high, with corymbs 1 dm. high and nearly as broad) and *Senecio pauciflorus*. And when we began to find species which we had not known from north of Bay of Islands, the Humber or the Exploits, *Anemone multifida* var. *hudsoniana* DC., *Potentilla pectinata* Raf. and *Hedysarum alpinum* var. *americanum* Michx., for example, and *Draba pycnosperma* Fern. & Knowlt., heretofore known only from Percé at the tip of the Gaspé Peninsula, we naturally regretted that we had time only to snatch the most obvious plants and these from only one extremely limited

area of cliff and talus. Traveling was difficult, walking and tumbling in the bushy talus or along the half-inch shelves of the cliff; and when we finally got around to John Kanes's Ladder, a dripping slaty wall, vertical and covered with vegetation, it was already late and we must travel rapidly if we were to reach the shore-trail before dark. But we had to stop long enough to get the *Epilobium* which, spire-like or savin-like, stood on the wet lower end of the Ladder. It was quite strange to us, not only in its peculiar fastigiate branching but in its very fleshy leaves; and by the beautiful fleshy bulbs at the bases of its stems it at once showed its affinity. It is a new species nearest related to the rare Rocky Mountain *E. saximontanum* Hausskn.

There are very many more endemics or epibiotics in the region of John Kanes's Ladder and the limestone escarpments of Doctor Hill; but the party which goes to find them will do well to profit by our experience and take a tent and food enough for two or three days. And it is hoped that they will be early enough to get in flower and young fruit the willow of the talus which so much interested us. In 1865, the great student of willows, Andersson, described *Salix Barclayi*, **S. latiuscula*,[1] as a subspecies of the Alaskan shrub, with "*Hab.* in Terra Nova (De la Pylaie)." It is said to appear intermediate between *S. lucida* and *S. cordata*, having the oval subcordate leaves 1½ inches long, 1 in. broad, lustrous, short-acuminate, etc., and differing from the Alaskan species in its oval leaves and in having sparingly tomentose capsules. La Pylaie had but a single specimen; it is not known just where he got it; and *S. Barclayi*, **S. latiuscula* has remained a puzzle. On the talus of Doctor Hill, and likewise on the escarpment of Bard Harbor Hill, is a beautiful shrub which in foliage matches Andersson's description but we need young material. The few battered and weather-worn capsules which we secured are now quite glabrous, but that may be the result of hard usage. The identity of the shrub is now a problem; and it is not clear that La Pylaie actually visited Doctor Hill. In describing Ingornachoix Bay he wrote: "mais on la peut néanmoins reconnaître par les deux hautes collines situées dans l'intérieur des terres au nord-est, qui dominent toutes les autres parties plus avancées, et se coupent d'une manière très-brusque à leur extrémité: on les appelle les *montagnes* ou *hauteurs Saint-Jean;*" and again he referred to "l'embrouchure d'une rivière assez considérable, surtant d'un lac situé au midi des hauteurs de

[1] Anderss. Mon. Sal. 165 (1865).

Saint-Jean."[2] La Pylaie explored for eight days in this region, but whether he actually ascended the hills and whether our shrub is what he collected as the basis of *Salix Barclayi*, **S. latiuscula* are still unsettled questions.

Wiegand, Gilbert and Hotchkiss had followed up Doctor Brook; and during the next two days, when the sea was altogether too rough for us to cross to St. John's Island, as we had earnestly hoped to do, we scoured the lower levels and also got at the lower escarpment of Bard Harbor Hill. Nothing spectacular was found, but Gilbert and Hotchkiss extended southward the range of *Ranunculus hyperboreus* by finding it in a beaver-pond near the Yellow Marsh; and we established new northern limits for *Cystopteris bulbifera* (L.) Bernh., *Onoclea sensibilis* L., *Muhlenbergia racemosa* (Michx.) BSP., *Alopecurus aequalis* Sobol., *Rynchospora alba* (L.) Vahl., *Carex Crawfordii* Fern., *C. projecta* Mackenzie, *Juncus effusus* var. *Pylaei* (Laharpe) Fern. & Wieg., *Ranunculus Macounii* Britton and *Epilobium nesophilum* Fern.

Our time being exhausted and St. John's Island now out of the question, we returned to Flower Cove on the 27th, stopping to collect the better things from Dog Peninsula, for which Long and I had a morbid sentiment after the grounding of the "Glencoe" there; and in passing through Derby's Tickle we landed to explore Otter Pond, a large shallow pond covering limestone pavement, there securing remarkably fine fruiting material of *Myriophyllum alterniflorum* DC. and *M. exalbescens* Fern. As soon as the specimens were cared for we allowed ourselves one more day in the field. Long and I went out locally for mature material of various things and Wiegand and Hotchkiss proceeded to East Brook, entering St. Barbe Bay, for aquatics. They got a splendid collection, including three of the most local species of Newfoundland, *Potamogeton Friesii* Rupr., *Zannichellia palustris* var. *major* (Boenn.) Koch and *Callitriche hermaphroditica* L.; and, new to Newfoundland, though long expected, *Potamogeton vaginatus* Tausch. Soon everything was packed and ready for the return home, but during a last constitutional walk to the swimming pond, south of the Rock Marsh, Long and I had our turn with *Potamogeton vaginatus*, but that was mild sport compared to the collecting of a strange pondweed with large winter-buds, for this proves to be the extremely rare *P. Hillii* Morong, a species previously

[2] La Pylaie, *Voyage a l'Ile de Terre-Neuve*, 73–75 (1825).

known from western New England to the Great Lake region, of which the winter-buds have been unknown.

Thus, on our last walk, after the trunks were packed, we were finding species "new to Newfoundland." Our summer was over and Wednesday afternoon, September 2, the water being calm, John and Wallace Whalen took us and our baggage by motor-boat across the Straits to "the Labrador" to catch the "North Shore," which would sail early Sunday morning from Bradore for Quebec. It was necessary to be forehanded for at this season the weather is most uncertain and, as it proved, that was the last day for a week in which a small boat could cross the Straits. To Wiegand and me it was a particularly enjoyable crossing for we were returning to the Grant's at Blanc Sablon, where Kidder and I had spent a most happy week in 1910 and where Wiegand had enjoyed the hospitality over a week-end. And the hospitality has in no way lessened. Mr. Edwin Grant, now claiming to be an old man, has retired from the active management of the big fishery but he is as alert and apparently as energetic as ever; and the active management has devolved upon his son, Mr. Sam. Grant. The three and a half days of our visit at Blanc Sablon, the renewal of botanizing at this fascinating corner of Labrador, the evenings of music and radio with Mr. and Mrs. Sam. Grant, and the hospitality shown our party by Mr. and Mrs. Hubert Cashman and by Mr. Butts, the Customs officer, will never be forgotten; but, forming no real part of our Newfoundland exploration, they can simply be mentioned here.

In 1924, Long and I estimated that, in order merely to take the cream from the flora of western Newfoundland, ten expert botanists would need fifty seasons. Our work of 1924, with three botanists, and of 1925, with five to seven (average six) has only slightly reduced the necessary time. We left Burnt Cape, Ha-Ha Point, Quirpon, Cape Onion, Boat Harbor, Big Brook, 4-Mile Cove, St. John's Island, Bard Harbor Hill and Doctor Hill always with keen realization that there was plenty more to do. Every time we landed on the shore of the Straits we found new specialties; the islands near St. John's Island have not been touched; Caleb Chambers tempted us with descriptions of the Bluey Hills, the Hummocky Hills and other regions east of the Highlands of St. John; and we did not once set foot on the great tablelands of the Long Range. There is plenty to do; the region, retaining a large remnant of the ancient flora which elsewhere

across America was mostly destroyed by the advances of Pleistocene ice, is full of endemics and epibiotics. We have brought back in two seasons more than 175 species never before known from Newfoundland, but there are hundreds of others yet to be found; and many of them, like many already known, will throw a vivid light upon the relative ages and the rate of evolution of species.

Explanation of Plates 153–155

Pl. 153. Fig. 1 (upper). Western spur of Ha-Ha Mountain, showing ancient weathering and lack of recent planing by an ice-sheet. Fig. 2 (left). Deeply weathered limestone rock-barren back of Savage Cove, characteristic near sea-level in northwestern Newfoundland, the rotted rock-mantle not removed by a recent ice-sheet. Vegetation here occupies the deep fissures, but in areas where the mantle has disintegrated into fine gravel and clay the plants are more numerous and are generally dispersed. Fig. 3 (right). Bayard Long collecting *Ranunculus pedatifidus* var. *leiocarpus*, western face of Ha-Ha Mountain.

Pl. 154. Fig. 1 (upper). On the tableland of Bard Harbor Hill, deeply mantled with angular blocks and gravel; Doctor Hill to the south. Fig. 2 (left). Horizontal limestones, washed by the sea, St. John's Island. Fig. 3 (right). Horizontal limestones, beyond the reach of the sea, St. John's Island; the talus not removed by sea nor glacier.

Pl. 155. Fig. 1 (upper). John Kanes's Ladder and limestone escarpment to the southwest, Doctor Hill. Note the great accumulation of talus. Fig. 2 (left). Escarpment of Doctor Hill, northeast of John Kanes's Ladder. Note the high talus. Fig. 3 (right). Looking directly up John Kanes's Ladder. Note the long-weathered and rotted rock-wall.

(To be continued.)

NORTHWESTERN NEWFOUNDLAND.

FIG. 1 (upper). Rock-mantle on tableland of Bard Harbor Hill. FIG. 2. (left). Horizontal limestones, washed by the sea, St. John's Island. FIG. 3. (right). Horizontal limestones, with undisturbed talus, St. John's Island.

NORTHWESTERN NEWFOUNDLAND.

FIG. 1 (upper). John Kanes's Ladder and escarpment to the south, Doctor Hill. FIG. 2 (left). Limestone escarpment of Doctor Hill, northeast of John Kanes's Ladder. FIG. 3 (right). Looking up John Kanes's Ladder, with rotted rock-walls.

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND.

M. L. Fernald.

(*Continued from p. 129.*)

Part III. Noteworthy Vascular Plants collected in Newfoundland, 1924 and 1925.

There is no satisfactory list of Newfoundland plants, and the detailed *Flora* which Professor Wiegand and I began in 1910 still needs so many finishing touches that it cannot now be presented. During the past two seasons, however, so many plants have been found which are new to the flora either of Newfoundland or of eastern America that their orderly enumeration at this time is appropriate; and, in order to determine the exact identities of some species, detailed revisions of certain groups have been necessary. In so far as these revisions are completed they are here presented; but certain groups, highly developed in the flora of Newfoundland, still await more critical study and reports upon them must be deferred. These include, among others, the genera *Poa*, *Polygonum* § *Avicularia*, *Cochlearia*, *Euphrasia*, *Campanula* and *Taraxacum*. In some cases, where new northern or southern limits in Newfoundland have been established, it has seemed appropriate to note species already known from remote sections of the island; and in a few cases new species are described or combinations made for extra-limital plants which have come to my attention in studying those of Newfoundland.

Woodsia alpina (Bolton) S. F. Gray. Dry limestone cliffs, western face of Doctor Hill, and calcareous escarpments, western face of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, nos. 27,203, 27,204. See pp. 124, 125. Earlier collections only from Notre Dame Bay.

W. GLABELLA R. Br. Crests of limestone escarpment, western face of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, no. 27,205. See p. 124. Not previously known from north of Port-à-Port Bay and Notre Dame Bay.

CYSTOPTERIS BULBIFERA (L.) Bernh. Shaded base of wet escarpments of calcareous sandstone, western face of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, no. 27,206, the first station north of Bay of Islands. See p. 127. At its northernmost station *C. bulbifera* is associated with a peculiarly boreal group of species, including the two preceding and *Poa alpina* L., *Luzula spicata* (L.) DC., *Salix vestita* Pursh, *S. calcicola* Fern. & Wieg., *Draba rupestris* R. Br., *Arabis alpina* L., *Saxifraga cespitosa* L., *S. oppositifolia* L., etc.

C. MONTANA (Lam.) Bernh. Mossy glades in spruce thickets, Savage Cove, *Fernald, Long & Dunbar*, no. 26,153. See p. 75. The only station known in Newfoundland. Found directly across the Straits, at Forteau and Blanc Sablon on the Labrador side.

THELYPTERIS SPINULOSA (O. F. Muell.) Nieuwl., var. **fructuosa** (Gilbert), n. comb. *Nephrodium spinulosum fructuosum* Gilbert, List N. A. Pterid. 37 (1901).

T. spinulosa, var. *fructuosa* stands out rather definitely in the series of variants of *T. spinulosa*. In Newfoundland it is more generally distributed than var. *intermedia* (Muhl.) Nieuwl.

The writer finds the following arrangement of the eastern American varieties of *T. spinulosa* useful and it may be of service to others.

a. Basal inferior and superior pinnules of the lowermost pinnae subopposite, rarely more than 4 mm. apart; the inferior 1–6 cm. long, if more than twice as long as the superior not exceeding the 2nd inferior pinnule *b*.

b. Frond glabrous, twice pinnate; the pinnae obliquely ascending, gradually tapering to apex; their pinnules rarely cleft nearly to the middle; the basal inferior one usually longer than the 2nd inferior one: indusia glabrous: scales of the stipe pale-brown or cinnamon-color . . . *T. spinulosa* (typical).

b. Frond commonly minutely glandular especially on the rhachis and rhacheolae, tripinnatifid or sometimes tripinnate; the pinnae slightly ascending to divergent; the basal inferior one shorter than to rarely exceeding the 2nd inferior one: indusia glandular: scales of the stipe usually dark-brown at base *c*.

c. Mature indusia 0.8–1.4 mm. broad: pinnae gradually tapering to apex . . . . . Var. *fructuosa*.

c. Mature indusia 0.5–0.8 mm. broad: pinnae usually narrowed rather abruptly to prolonged lance-linear tips Var. *intermedia* (Muhl.) Nieuwl.

a. Basal inferior and superior pinnules of the lowest pinnae remote, 0.5–2 cm. apart; the inferior 3–10 cm. long, 2–4 times as long as the superior and commonly exceeding the 2nd inferior pinnule *d*.

d. Frond ovate to ovate-triangular, 1–6.5 dm. long, 1–4 dm. broad, tripinnatifid (the basal pinnae simetimes tri-

pinnate), not glandular; the lower pinnules of the lowermost pinnae with oblong obtuse sharply toothed or cleft segments: rhachises of the spreading-ascending pinnae naked or with scattered linear- to lance-attenuate spreading scales: indusia glabrous
Var. *americana* (Fisch.) Weatherby.

d. Frond lanceolate, broad at base, gradually tapering from near the middle to the elongate tip, 2–6 dm. long, 1.2–2.5 dm. broad, tripinnate (the basal pinnae sometimes quadripinnate), somewhat glandular beneath; the ultimate divisions (of the 3rd or 4th order) of the lowermost pinnae elliptic-lanceolate to narrowly rhombic, subpetiolulate to petiolulate: rhachises of the spreading-ascending to falcate-recurving pinnae bearing ovate brown scales as well as bristle-like chaff: indusia glandular.....Var. *concordiana* (Davenp.) Weatherby.

The wholly anomalous var. *concordiana*, it may be noted, has been known only from the original individual. It is very similar to and perhaps identical with the equally anomalous and rare English *Lastrea dilatata*, var. *lepidota* Moore.

In one of Schinz & Thellung's papers, in Vierteljahrss. Natur. Gesells. Zürich, lx. 339 (1915), *Dryopteris austriaca* (Jacq.) H. Woynar is published as a new combination based upon *Polypodium austriacum* Jacq. Obs. Bot. i. 45 (1764). It is frankly admitted, however, that the exact identity of *P. austriacum* is in doubt, for "*P. austriacum* Jacq. wird meistens zu *D. spinulosa* gezogen; nach Woynar soll sie speciell zur Unterart *dilatata* (Hoffm.) C. Christensen gehoren." Jacquin's description is wholly unconvincing and it is difficult to find specimens of the *Thelypteris spinulosa* group which satisfy his requirement of sericeous-woolly bases: "Petioli omnes sunt pilosi, pinnae & stipes inferior minus; sed hic ad basin lanugine sericea obducitur." The character, *pilose* fronds ("frondibus supra decompositis, pilosis"), is also difficult to reconcile with either *T. spinulosa* or its var. *dilatata*. To displace the long-used and clearly understood names, *Polypodium spinulosum* Muell. (1777) and *P. dilatatum* Hoffm. (1796), by such an indefinite name as *P. austriacum* Jacq. can lead only to confusion or perpetual doubt.

Thelypteris Filix-mas (L.) Nieuwl. Frequent and abundant on rich slopes and calcareous talus along the Straits of Belle Isle and generally southward near the West Coast. See p. 110.

Polystichum Lonchitis (L.) Roth. Exposed or partly shaded limestone ledges or talus, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,231; Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 27, 232; western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 27,235. See p. 102.

Not previously known from north of Bay of Islands and Notre Dame Bay.

Athyrium alpestre (Hoppe) Rylands, var. americanum Butters. Abundant and very handsome on quartzite rocks and gravels along brooks in gulches of Bard Harbor Hill, Highlands of St. John. See p. 117. This and the upper slopes of Tabletop Mts., Gaspé, are the only known regions for this problematic plant east of the Rocky Mts. On luxuriant clumps the fronds become 9 dm. long and 2.5 dm. wide.

Asplenium viride Hudson. Exposed or partially shaded limestone along the Straits of Belle Isle, from Big Brook to Burnt Cape, the fronds subcoriaceous and tough, often forming dense turf. See p. 99. Limestone cliffs and ledges, western face of Bard Harbor Hill, Highlands of St. John, *Wiegand, Gilbert & Hotchkiss*, no. 27,249, *Fernald & Long*, no. 27,253. Not previously known from north of Bay of Islands.

Cryptogramma Stelleri (Gmel.) Prantl. Frequent in crevices of calcareous ledges and cliffs, by streams and on escarpments of the Highlands of St. John; not previously known from north of Cow Head. See p. 118.

Polypodium virginianum L. Locally abundant on mossy crests and shaded ledges, Highlands of St. John; not previously known from north of Cow Head.

Schizaea pusilla Pursh. Wet bog-barrens, Trepassey and Biscay Bay, *Fernald & Long*, nos. 26,156, 26,157, the first stations on the Avalon Peninsula. See p. 84.

Osmunda Claytoniana L. Slopes and gulches of Bard Harbor Hill, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, nos. 27,264, 27,265, the first stations on the West Coast north of Bay of Islands. See p. 124.

O. cinnamomea L. Coniferous woods on lower southwestern slope of Bard Harbor Hill, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,266, the first station on the West Coast north of Chimney Cove.

Botrychium Lunaria (L.) Sw. Common in turf or peat overlying limestone, western Newfoundland, and along the Straits quite to Quirpon. See p. 59. Passing to var. onondagense (Underw.) Clute, which is more inclined to occur in shade but which, when occurring in the open, seems to be more sensitive than typical *B. Lunaria*. See p. 119.

B. lanceolatum (S. G. Gmel.) Ångstr. Dryish meadow-slope south of Ship Cove, Sacred Bay, *Fernald, Wiegand & Long*, no. 27,273, the only definite station known to us. See p. 122. Recorded from Newfoundland, without locality, by Underwood, Bull. Torr. Bot. Cl. xxx. 46 (1903).

B. matricariaefolium A. Br. Dryish meadow south of Ship Cove, *Fernald, Wiegand & Long*, no. 27,276 (see p. 122); very scarce

on turfy slopes and trap talus, Sacred Island, *Wiegand, Gilbert & Hotchkiss*, no. 27,274, *Fernald & Long*, no. 27,275; very scarce, turfy shore, Flower Cove, *Fernald & Long*, no. 27,277. New to Newfoundland.

EQUISETUM PRATENSE Ehrh. Mossy glades in spruce woods north of Doctor Hill, St. John Bay, *Fernald & Long*, no. 27,284, the first station east of the Gaspé Peninsula. See p. 125.

LYCOPODIUM INUNDATUM L., var. BIGELOVII Tuckerm. Margins of shallow pools in peaty barrens, Port aux Basques, *Fernald, Long & Dunbar*, no. 26,181; wet bog-barrens, Trepassey, *Fernald, Long & Dunbar*, no. 26,182; collected in dried-out pools in tundra, Quarry, *Fernald & Wiegand*, no. 4365. See pp. 56, 84. A coastal plain extreme heretofore not positively identified from northeast of Nova Scotia.

ISOËTES MACROSPORA Dur. Pools and rills among the gneiss hills, Port aux Basques, *Fernald, Long & Dunbar*, no. 26,196; collected in 1910 at Curling by *Fernald & Wiegand* (no. 2404). Recorded by Pfeiffer only from the Avalon Peninsula.

I. TUCKERMANI A. Br. Gravelly margins of ponds, Whitbourne, *Fernald, Long & Dunbar*, nos. 26,197, 26,198; muddy bottom of shallow pool, Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 27,302; also in pond, Frenchman's Cove, Bay of Islands, *Mackenzie & Griscom*, no. 10,031. See pp. 85, 120. Records by Pfeiffer only from Quiddy Viddy Lake.

POTAMOGETON VAGINATUS Turcz. In dead water near tide-limit, East Brook, St. Barbe Bay, *Wiegand & Hotchkiss*, no. 27,327; in water over muddy limestone pavement, large pond in barrens south of Flower Cove, *Fernald & Long*, no. 27,328; new to Newfoundland. See p. 127.

P. CONFERVOIDES Reichenb. Shallow pools in peaty barrens among the gneiss hills, Port aux Basques, *Fernald, Long & Dunbar*, no. 26,225. See p. 56. Heretofore known in Newfoundland only from the central and southeastern areas.

P. HILLII Morong. In dead water over muddy limestone pavement, large pond in barrens south of Flower Cove, *Fernald & Long*, no. 27,330, the first from northeast of Vermont. See p. 127. The winter-buds, heretofore scarcely known, were splendidly developed, as large as in *P. obtusifolius* M. & K., but with characteristic bristle-tipped ligules and leaves.

P. FRIESII Rupr. Dead water near tide-limit, East Brook, St Barbe Bay, *Wiegand & Hotchkiss*, no. 27,331, the first in Newfoundland from north of Harry's River. See p. 127.

P. OAKESIANUS Robbins. Pond-hole in boggy spots on hills, western side of Quirpon Island, *Wiegand, Gilbert & Hotchkiss*, no. 27,339, the first from north of Bonne Bay and Notre Dame Bay. See p. 120.

P. PRAELONGUS Wulfen. Deep water of large pond, Cook Point,

Pistolet Bay, *Fernald, Gilbert & Hotchkiss*, no. 27,346, the first from north of the Humber and Notre Dame Bay. Afterward collected on the Labrador side of the Straits (Trout Pond, Blanc Sablon River, *Fernald & Long*, no. 27,347).

Zannichellia palustris L., var. major (Boenn.) Koch. Dead water near tide-limit, East Brook, St. Barbe Bay, *Wiegand & Hotchkiss*, no. 27,349, the first on the West Coast from north of Bay St. George. See p. 127.

Glyceria Fernaldii (Hitchc.) St. John. Shallow water of old beaver pond near the Yellow Marsh, back of Bard Harbor, St. John Bay, *Gilbert & Hotchkiss*, no. 27,361, the first from north of Bay of Islands.

G. fluitans (L.) R. Br. Along spring-rill in swale, Trepassey, *Fernald, Long & Dunbar*, no. 26,311, an extension southward from the region of St. John's; also in swales at Bay Bulls. See pp. 83, 85.

Puccinellia coarctata Fern. & Weath. Apparently of general occurrence in northwestern Newfoundland, often occurring in limestone gravel or humus above the direct influence of sea-water. See p. 118.

In 1916 (Rhodora, xviii. 1, 2) Mr. Weatherby and I pointed out that the name *Puccinellia* Parlatore (1848) has precedence as a validly published generic name over *Atropis*. But, since European students to whose judgment we should ordinarily defer, notably Briquet and Schinz and Thellung[1], are maintaining *Atropis*, it is perhaps advisable to reiterate the main arguments for and against it. In Ruprecht's *Flores Samojedorum Cisuralensium*[2] several species of *Poa* were enumerated with parenthetical sectional or subgeneric names: "Poa (Phippsia) algida (R. Br.)," "Poa (Catabrosa) airoides Koel.," "Poa (Atropis) distans L.," etc. and at the close of the discussion of "Poa (Dupontia) pelligera" occurred the following: "Observatio necessaria. Arctophila* a Catabrosa (airoide) praesertim differt glumarum conformatione et longitudine, hac nota etiam et insuper valvulis ecostatis a Glyceria R. Br. recedit. Atropis Trin. (P. distans) Catabrosae quoad glumas proxima, spiculas habet (saltem in statu virgineo) lineares, fere teretes; in Arctophila nostra semper ex ovato-oblongae vel lanceolatae. E. conditione glumarum generum series fortasse sequens: Dupontia, Arctophila, Poa, Atropis, Catabrosa, Phippsia, Coleanthus." etc. It has been pointed out that in translating Ruprecht's Latin, Weatherby and I made an error and that the last sentence should begin, "From the condition of the

[1] Schinz & Thell. Vierteljahrss. Naturf. Gesells. Zür. lxviii. 459–461 (1923).
[2] Rupr. Beitr. zur Pflanzenk. des russischen Reiches ii. 61, 64 (1845).

glumes a series of genera perhaps as follows." This, however, does not change our main contention that, since Ruprecht definitely treated all these plants as *Poa* and only by a comment at the end of the treatment half-heartedly tried to call them a series of genera, still using the initial "*P.*" "P. distans" and "P. (Dupontia) psilosantha," the genus *Atropis* (and other genera with it) was not adequately launched. As we have already pointed out, "it is noteworthy that most authors who take up *Atropis* cite not only the Ruprecht reference but the later reference to Grisebach in Ledebour (1853)[1] as validating the genus. Grisebach, in Ledebour, certainly gave a clear generic characterization and treated the species unequivocally as species of *Atropis*, so that *Atropis* as a well published genus should date from Grisebach's treatment in 1853. In 1848, however, Parlatore, with equal clarity and completeness had characterized *Puccinellia* as a genus to include some of the species, *P. distans* and *P. maritima*, later placed by Grisebach under *Atropis;* and it seems to us that the cause of sound nomenclature is best served by maintaining the fully and definitely published *Puccinellia* Parlatore (1848) rather than the inadequately and uncertainly published *Atropis* Trinius in Ruprecht (1845, validated by Grisebach in 1853)." The last point is most important. Shall we gain a sound and stable nomenclature by choosing generic names which are doubtfully or only half-heartedly published instead of those which are put forward with definiteness and precision?

FESTUCA SUPINA Schur. Abundant on calcareous gravel and rock along the Straits of Belle Isle. See p. 102. Previous records from mountains to the south.

F. VIVIPARA (L.) Sm. In peat or turf, rarely on open gravel, abundant in northwestern Newfoundland. See pp. 53, 59.

It is not satisfactory to consider *F. vivipara* merely a viviparous state of *F. supina* or of *F. ovina* L., as is done in Europe. The latter is not indigenous in America, merely an introduction from Europe, but both *F. supina* and *F. vivipara* are indigenous in boreal America. If *F. vivipara* were merely a viviparous state of *F. ovina* or of *F. supina* its occasional non-viviparous panicles should be like those of the latter species. In *F. ovina* and *F. supina*, however, the lemnas are distinctly aristate; but in *F. vivipara* they are muticous. The change from a fertile to a viviparous spikelet should not also alter the lemmas from aristate to muticous.

[1] Griseb. in Ledeb. Fl. Ross. iv. 388 (1853).

F. CAPILLATA Lam. Dry gneiss crests and ridges back of Port aux Basques, *Fernald, Long & Dunbar*, no. 26,319; silicious gravelly slope, Harbour Breton, *Fernald, Long & Dunbar*, no. 26,320. Earlier collections indicate a range across the breadth of southern Newfoundland, where the plant is clearly indigenous. See pp. 50, 56.

POA ALPINA L., var. BIVONAE (Parl.) St. John. Dripping slaty cliffs by waterfall, John Kanes's Ladder, western face of Doctor Hill, *Fernald & Long*, no. 27,400. The only other Newfoundland collection is from Table Mt., Port-à-Port Bay.

P. ALPINA, var. FRIGIDA (Gaud.) Reichenb. Turfy or gravelly limestone shores, tundra or barrens, rather general along the Straits of Belle Isle and south to St. John Bay; also about Port-à-Port Bay and Bay St. George: Boat Harbor, *Fernald, Wiegand & Long*, no. 27,393; Big Brook, *Wiegand, Gilbert & Hotchkiss*, no. 27,390; Sandy (Poverty) Cove, *Pease & Griscom*, no. 27,389; Brig Bay, *Fernald, Long & Dunbar*, no. 26,293; St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,396; Table Mt., Port-à-Port Bay, *Fernald & St. John*, no. 10,784, *Mackenzie & Griscom*, no. 10,083; Green Gardens, Cape St. George, *Mackenzie & Griscom*, no. 11,041. The first American records. See pp. 79, 97.

P. ALPINA, var. BREVIFOLIA Gaud. Dry limestone barrens, from Straits of Belle Isle south of St. John Bay: Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,391; Boat Harbor, *Fernald, Wiegand & Long*, no. 27,392; Savage Cove, *Fernald, Pease & Long*, no. 27,394; St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no 27,397. The first records from America. See p. 102.

POA LAXA Haenke. Damp quartzite cliffs along upper Deer Pond Brook, Highlands of St. John, *Fernald & Long*, no. 27,405, the first collection from Newfoundland. See p. 124.

CATABROSA AQUATICA (L.) Beauv. Abundant along the Straits and probably the length of the West Coast. Tremendously variable; in rich swales and sloughs with panicles more than 1 dm. long, in drier habitats with them reduced to 2 cm.

HORDEUM BOREALE Scribn. & Sm. Turfy or gravelly slopes, swales, and strands, abundant at the eastern end of the Straits of Belle Isle: Little Quirpon, *Fernald & Gilbert*, no. 27,440; Mauve Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,442; Ship Cove, *Fernald, Wiegand & Long*, no. 27,441. See p. 121. Our only previous record was from Port Saunders. A species of the north Pacific slope of America known in the East only from northern Newfoundland and adjacent Labrador.

TRISETUM MELICOIDES (Michx.) Vasey. By brook in boggy thicket southeast of Flower Cove, *Wiegand, Gilbert & Hotchkiss*, no. 27,456, the first Newfoundland station outside the Exploits valley.

DESCHAMPSIA CESPITOSA (L.) Beauv. This polypmorhous circumpolar species is represented in eastern America by four clearly

defined varieties, three of which occur in Newfoundland. Their diagnostic characters are indicated below.

a. Culms 0.65–1.7 m. high, 2–6 mm. in diameter at base: leaves elongate, flat or only tardily involute; the basal mostly 1.5–6 dm. long, with ligules 5–12 mm. long; the lower cauline with blades 1.5–4 dm. long: panicle 1.5–4.5 dm. long, diffuse *b.*
  b. Spikelets 3.5–5.5 mm. long.....Var. *genuina.*
  b. Spikelets 2–3 mm. long.....Var. *parviflora.*
a. Culms 0.7–7.5 dm. high, 1–2.5 mm. in diameter at base: leaves flat or involute; the basal mostly 0.3–3 dm. long, with ligules 2–7 mm. long; the lower cauline with blades 0.1–1.8 dm. long: panicle 0.2–2.2 dm. long *c.*
  c. Spikelets 3–4.5 mm. long: panicle lax, rather diffuse during anthesis.....Var. *glauca.*
  c. Spikelets 4.5–7 mm. long: panicle commonly contracted, occasionally diffuse, during anthesis.....Var. *littoralis.*

Var. GENUINA Gren. & Godr. Fl. de France, iii. 507 (1855). *Aira cespitosa* L. Sp. Pl. i. 64. (1753). *A. altissima* Moench, Meth. 182 (1794). *D. cespitosa* (L.) Beauv. Agrost. 91, 160, expl. Pl. xviii. (1812). *A. cespitosa*, ε. *firmula* Wimm. & Grab. Fl. Sil. i. 60 (1827). *A. cespitosa genuina* Reichenb. Ic. Fl. Germ. i. t. XCVI. fig. 1682 (1834). *A. cespitosa* b) *altissima* (Moench) Aschers. Fl. Brand. i. 833 (1864).—Newfoundland; Montana to southern British Columbia, south to Colorado, Nevada and California; Eurasia. The following are characteristic. NEWFOUNDLAND: sandy and gravelly banks, Whitbourne, *Fernald & Wiegand*, no. 4599; upper border of gravelly margin of Junction Pond, Whitbourne, *Fernald & Long*, no. 26,282; gravelly thickets along Harry's River, *Fernald & Wiegand*, no. 2589. MONTANA: Bozeman, *Rydberg*, no. 2219; wet meadow, Sheep Creek, *Rydberg*, no. 3301. WYOMING: Laramie, *Merrill*, no. 25. COLORADO: slopes, Mt. Carbon, *Tidestrom*, no. 3725. IDAHO: Forks of St. Mary's River, *Leiberg*, no. 1118; canyon at head of South Fork of the Humboldt, *Heller*, no. 9727. CALIFORNIA: Prattville, *Heller & Kennedy*, no. 8790; Mt. Eddy, *Copeland*, no. 3798. OREGON: wet soil in shade of *Coniferae*, Big Meadows, Des Chutes River, *Leiberg*, no. 523; Camas Prairie, *Griffith & Hunter*, no. 76; ditch, Salem, *Nelson*, no. 1354. BRITISH COLUMBIA: summit of Selkirk Mts., *J. Macoun;* Chilliwack Valley, *J. M. Macoun*, no. 26,084.

Var. PARVIFLORA (Thuill.) Richter, Pl. Eu. i. 56 (1890). *Aira parviflora* Thuill. Fl. Par. ed. 2, i. 38 (1799). ? *A. cespitosa* β. *virescens* Wimm. & Grab. Fl. Sil. i. 60 (1827).—Locally in New England where introduced from Europe. MAINE: damp hollow, woods and thickets along shore, Islesboro, *Woodward, Bissell & Fernald*, no. 8743. MASSACHUSETTS: edge of field, Washington, July 17, 1919, *Hoffmann.* CONNECTICUT: open swamp, very abundant, Franklin, July 8, 1906, *Woodward;* introduced in grassland, Southington, June 21, 1903, *Bissell;* spreading in partly shaded dooryard, South Windsor, *Weatherby*, no. 4945.

Var. GLAUCA (Hartm.) Lindm. fil. Svensk Fanerogamfl. 81 (1918). *Aira ambigua* Michx. Fl. Bor.-Am. i. 61 (1803). *D. glauca* Hartm. Handb. Skand. Fl. 448 (1820). *A. aristulata* Torr. Fl. N. Mid. U. S. i. 132 (1824). *A. cespitosa* β. *glauca* Hartm. l. c. ed. 2: 25 (1832). *A. cespitosa*, var. *minor* Lange, Fl. Dan. xvii. fasc. l. 4, t. MMDCCCC-XLV, fig. 1 (1880).—River-banks, lake-shores and damp, chiefly calcareous, soil, Newfoundland to Yukon, south to northern New Jersey, Pennsylvania, Ohio, Illinois, Arizona, and California; Faroe Islands and Scandinavia. The following, selected from a large series of specimens, are representative. NEWFOUNDLAND: Rock Marsh, Flower Cove, *Fernald, Long & Dunbar*, no. 26,279. QUEBEC: "circa lacus *Mistassins* et juxta amnes in lacum *S. Joannis* defluentes," *Michaux* (type of *Aira ambigua* in herb. Mus. d'Hist. Nat. Paris), "Ab AIRA *cespitosa* foliis tantum differt etiamque dimidio minor est"; Ile-aux-Couleuvres, Lac St-Jean, *Victorin*, no. 15,258; Bonaventure River, August, 1904, *Collins, Fernald & Pease;* St. Lawrence River below Quebec, July 9, 1905, *Churchill.* NEW BRUNSWICK: Woodstock, *Fernald & Long*, no. 12,658; Westfield, *Fassett*, no. 2183. NOVA SCOTIA: Shubenacadie Grand Lake, *Fernald, Bartram & Long*, no. 23,285; Cedar Lake, *Fernald, Bissell, Pease, Long & Linder*, no. 19,946; Yarmouth, *Bissell & Pease*, no. 19,944. MAINE: Fort Fairfield, *Fernald*, no. 183; Milford, *Fernald*, no. 12,655; Winn, *Fernald & Long*, no. 12,657; Pembroke, *Fernald*, no. 1310; West Dresden, *Fassett*, no. 1045. NEW HAMPSHIRE: Lake Umbagog, Errol, *Pease*, no. 10,515; Dalton, *Pease*, no. 17,387; Summer's Falls, June 12, 1897, *Williams.* VERMONT: Lyndon, June, 1871, *Congdon;* Burlington, June 18, 1877, *Pringle;* Brattleboro, July 8, 1895, *Grout.* MASSACHUSETTS: Merrimack R., Lowell, July 20, 1882, *Swan.* CONNECTICUT: Connecticut R., East Haddam, *Weatherby*, no. 4295. NEW YORK: Spencer Lake, Spencer, *Metcalf*, no. 5698; Cortland, *Wiegand*, no. 3526; Bergen, *House*, no. 6521. NEW JERSEY: White Pond, Sussex Co., *Mackenzie*, no. 4648. PENNSYLVANIA: Pleasant Grove, *Heller*, no. 4819. ONTARIO: Belleville, *Macoun*, no. 2239; Wingham, June 17, 1892, *Morton.* MICHIGAN: Isle Royale, *Cooper*, no. 164. WISCONSIN: Jackson Harbor, June 21, 1896, *Schuette.* MINNESOTA: Thompson, Carlton Co., *Sandberg*, no. 395. MANITOBA: Lake Winnipeg Valley, 1857, *Bourgeau.* SASKATCHEWAN: Moose Jaw, *Macoun*, no. 13,080. ALBERTA: Red Deer Valley near Rosedale, *Moodie*, no. 1042; near Banff, July 4, 1891, *Macoun.* MONTANA: Forks of the Madison, *Rydberg & Bessey*, no. 3588. IDAHO: Victor, *Merrill & Wilcox*, no. 185. WYOMING: Laramie River, Albany Co., *Nelson*, no. 430; Washington Ranch, *Merrill & Wilcox*, no. 78. COLORADO: Gunnison, *Baker*, nos. 530, 553; Trout Creek Pass, July 18, 1873, *Coulter;* Hahn's Pass, *Goodding*, no. 1692; Hamor's Lake, *Baker, Earle & Tracy*, no. 982. ARIZONA: Willow Spring, *Rothrock*, no. 230, *Palmer*, no. 566. NEVADA: Jarbridge, *Nelson & Macbride*, no. 2005. CALIFORNIA: Big Trees, Calaveras Co., *Hillebrand*, no. 2246; near

Donner Lake, *Torrey*, no. 558. OREGON: Wallowa Mts., *Cusick*, no. 3126; Lower Albina, Portland, *Sheldon*, no. 11,125. WASHINGTON: Calispel Valley, *Kreager*, no. 328. YUKON: Carcross, *Eastwood*, no. 697e.

The identity of our plant with the Scandinavian var. *glauca* is definitely indicated by beautiful material collected in Torne Lapmark by Professor Alm. This is clearly matched by many American specimens, especially such small plants as *Fernald, Long & Dunbar*, no. 26,279 from Newfoundland; *Fernald & Collins* material from Gaspé Co., Quebec; *Eggleston*, no. 1 from Summer's Falls, New Hampshire; *Sandberg*, no. 395 from Minnesota; *Tweedy*, no. 616 from Yellowstone Park;

Var. LITTORALIS (Reut.) Richter, Pl. Eu. i. 56 (1890). *Aira cespitosa*, var. β. *littoralis* Reuter, Cat. Pl. Vasc. Genève. 116 (1832). *A. littoralis* (Reut.) Godet, Fl. Jura, 803 (1852). *D. cespitosa*, var. *alpina* Vasey in Beal, Grasses N. A. ii. 368 (1896). *D. alpicola* Rydb. Bull. Torr. Bot. Cl. xxxii. 601 (1905). *A. alpicola* Rydb. Fl. Rocky Mts. ed. 2, 1112 (1923).—Southern Labrador, western Newfoundland and eastern Quebec; Alaska to the alpine regions of Colorado, Utah and California; Eurasia. LABRADOR: wet sands and peats, Forteau, *Long*, no. 27,461; brackish shore, Blanc Sablon, *Fernald & Wiegand*, nos. 2583, 2586 (distrib. as var. *Wibeliana* (Sonder) Lædeb.). NEWFOUNDLAND: exsiccated peaty depressions in limestone barrens, Cape Norman, *Wiegand & Long*, no. 27,460; springy swale, Flower Cove, *Fernald, Long & Dunbar*, no. 26,281; serpentine tablelands, Bonne Bay, *Fernald & Wiegand*, no. 2588, *Kimball*, no. 126; serpentine barrens, Blomidon Mts., *Fernald & Wiegand*, no. 2585; river-bank, Coal River, *Waghorne*, no. 16 (as *D. bottnica* Wahlenb.); limestone tableland, Table Mt., Port-à-Port Bay, *Fernald & Wiegand*, no. 2584, *Fernald & St. John*, nos. 10,781–10,783; gravelly beach, St. George's Pond, *Fernald & Wiegand*, no. 2587; lakeside, Grand Lake, *Waghorne*, no. 18. QUEBEC: mossy serpentine barrens, alt. 1000–1100 m., and alpine brooks and pools, Mt. Albert, *Collins & Fernald*, nos. 24, 24a, *Victorin et al*, no. 17,786; Ste. Anne de Beaupré, *Macoun*, no. 69,230. ALBERTA: mountains north of Cavell Creek, *J. M. Macoun*, no. 98,349; south of Wilcox Pass, *Brown*, no. 1394; Lake Louise, *Brown*, no. 549. IDAHO: Soda Springs, *Mulford*, no. 53. WYOMING: many specimens from the mountains, at 2400–3600 m. COLORADO: many specimens from the mountains at 2600–3965 m. UTAH: Dyer Mine, Uintah Mts., *Goodding*, no. 1299. CALIFORNIA: Tuolumne Meadows, *Smiley*, no. 750; Lake of the Woods Meadow, Tahoe, *Smiley*, no. 65. ALASKA: Unalaska, *Harrington;* Attu Island, *J. M. Macoun*, no. 269.

(*To be continued.*)

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND.

M. L. Fernald.

(*Continued from p. 155.*)

DESCHAMPSIA ATROPURPUREA (Wahlenb.) Scheele. Wet quartzite rocks and gravel by brooks, gulches of Bard Harbor Hill, Highlands of St. John, the first stations in Newfoundland: upper Deer Pond Brook, *Fernald, & Long*, no. 27,462; Southwest Gulch, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,463. See p. 116.

AGROSTIS CANINA L. Moss and silicious rocks along rill, slope of South Hill, St. John's *Fernald, Long & Dunbar*, no. 26,257; margin of cold brook in spruce thicket, Bay Bulls, no. 26,258; gravelly margin of Goose Pond, Whitbourne, no. 26,259; dry gneiss crests and ridges and peaty barrens, Port aux Basques, nos. 26,260, 26,262. Older collections indicate that the species is indigenous across the breadth of southern Newfoundland. See pp. 50, 56, 81, 85.

A. PALUDOSA Scribn. Dry gravelly limestone barrens, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,479, the first Newfoundland station. Described from Blanc Sablon, Labrador but represented in the Gray Herbarium from as far west as Ouapitagone, Saguenay Co., Quebec (*St. John*, no. 90,123 as *A. borealis*). See p. 118.

A. MELALEUCA Trin. Springy swales and limy bog-barrens near the Rock Marsh, Flower Cove, *Fernald, Long & Dunbar*, nos. 26,253, 26,280, *Fernald, Pease & Long*, no. 27,481, *Fernald*, no. 27,483; dripping quartzite cliffs and ledges, upper Deer Pond Brook, High-

lands of St. John, *Fernald & Long*, no. 27,482; the only stations known in eastern America. See pp. 63, 109.

Calamagrostis Pickeringii Gray. Wet boggy tundra in central valley of Quirpon Island, *Fernald & Long*, no. 27,484, the first from north of Notre Dame Bay and Bonne Bay.

C. Pickeringii, var. debilis (Kearney) Fernald & Wiegand. Boggy barrens ("mesh") south of Ship Cove, *Fernald, Wiegand & Long*, no. 27,485, the first from north of Notre Dame Bay and Bonne Bay.

Ammophila breviligulata Fern. Dunes and sandy beach, Sandy Cove, Ingornachoix Bay, *Fernald, Long & Dunbar*, no. 26,273, the first Newfoundland station north of Bay St. George. See p. 80.

Alopecurus aequalis Sobol. Brookside in bushy swale on flat north of Doctor Hill, St. John Bay, *Fernald, & Wiegand*, no. 27,503; shallow water of old beaver pond near the Yellow Marsh, back of Bard Harbor, St. John Bay, *Gilbert & Hotchkiss*, no. 27,504; the only stations known north of Port-à-Port. See p. 127.

A. aequalis, var. natans (Wahlenb.) Fern., Rhodora, xxvii 198 (1925). Pools in tundra, Boat Harbor, *Fernald, Wiegand & Long*, no. 27,505. See p. 107. Known outside the arctic and subarctic regions only along the Straits of Belle Isle.

Muhlenbergia racemosa (Michx.) BSP. Boggy meadow bordering pond, Bard Harbor, St. John Bay, *Hotchkiss*, no. 27,509, the first from north of Bay of Islands. See p. 127.

Oryzopsis asperifolia Michx. Knoll in spruce thicket, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,510, the first from north of Bay of Islands.

Milium effusum L. Abundant in glades and gulches of Bard Harbor Hill, Highlands of St. John, the only Newfoundland region known for it except shores of Ingornachoix Bay. See p. 111.

Hierochloe odorata (L.) Wahlenb. Abundant in swales and tundra along the Straits. The previous Newfoundland collections belong to the seashore var. fragrans (Willd.) Richter.

Eriophorum Scheuchzeri Hoppe. Wet swales and margins of ponds, Flower Cove, *Fernald, Long & Dunbar*, no. 26,334, *Fernald Pease & Long*, nos. 27,443, 27,444, the first authentic stations in Newfoundland. See pp. 61, 109.

E. Chamissonis C. A. Meyer., var. aquatile (Norman) Fernald, Rhodora, xxvii. 207 (1925). Shallow pool at base of Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 27,545, the only known American station. See p. 120.

E. opacum (Björnstr.) Fernald. Abundant in limy bog-barrens and tundra along the Straits of Belle Isle. See pp. 53, 62, 98.

E. callitrix Cham. See Fernald, Rhodora, xxvii. 205 (1925). Wet peaty limestone barrens and tundra along the Straits of Belle Isle, the only region known for the species except St. Lawrence Bay on the western side of Bering Straits. See pp. 98, 105.

RYNCHOSPORA ALBA (L.) Vahl. Boggy meadow bordering pond, Bard Harbor, St. John Bay, *Hotchkiss*, no. 27,570, the first from north of Bonne Bay. See p. 127.

CAREX CAPITATA L. Peaty margins of pools in limestone barrens back of Big Brook, *Fernald & Long*, no. 27,575; peaty margins of pools in limestone barrens on the Highlands northeast of Big Brook, *Pease & Griscom*, no. 27,576; dryish tundra, Schooner (Brandy) Island, *Pease & Long*, no. 27,577; the first stations in Newfoundland. See pp. 98, 99.

C. INCURVA Lightf. A characteristic turf-plant on damp limestone along the Straits, eastward to Eddies Cove, southwestward to Deadman's Cove. See. pp. 61, 108.

C. CHORDORHIZA Ehrh., var. SPHAGNOPHILA Laestad. Springy swales and quaking bogs in the limestone barrens, Flower Cove, *Fernald, Long & Dunbar*, nos. 26,382, 26,383; swales on limestone barrens, Sandy (Poverty) Cove, *Fernald, Long & Gilbert*, no. 27,588; boggy swales, Eddies Cove, *Fernald, Wiegand & Long*, no. 27,587; the first American records for the variety. See p. 108.

C. STERILIS Willd. Frequent in peat overlying limestone, north to the Straits. See p. 79.

C. DEWEYANA Schwein. Peaty borders of spruce thickets near Mistaken Cove, *Fernald & Griscom*, no. 27,601; glades and openings in spruce thickets east of Big Brook, *Fernald, Wiegand & Hotchkiss*, no. 27,602; meadow below limestone escarpment, western face of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, no. 27,603; the first authentic collections from Newfoundland. See p. 100.

C. TRISPERMA Dew., var. BILLINGSII Knight. Wet bog-barrens, Trepassey, *Fernald, Long & Dunbar*, no. 26,376. See p. 84. The only other Newfoundland collection is from the East Branch of the Humber.

C. BIPARTITA All. *C. Lachenalii* Schkuhr. See Mackenzie, Bull. Torr. Bot. Cl. l. 348 (1923). Brookside on slaty hills east of Little Quirpon, *Fernald & Gilbert*, no. 27,622; wet mossy quartzite rocks along Mans Humbug Brook, Highlands of St. John, *Fernald & Long*, no. 27,617; new to Newfoundland. See pp. 121, 124.

C. GLAREOSA Wahlenb. Turfy slopes of slaty hills, Little Quirpon, *Fernald & Long*, no. 27,618, new to Newfoundland. See p. 121.

C. BRUNNESCENS Poir. True *C. brunnescens*, the stiff and low plant with brownish subapproximate ellipsoid spikes is a plant of exposed crests and headlands and southwest of Newfoundland is strictly alpine. The lax plant with remote obovoid greenish spike is var. SPHAEROSTACHYA (Tuckerm.) Kükenthal. It abounds in thickets and woodlands and extends well to the south in the eastern United States. It may prove to be a good species, *C. sphaerostachya* (Tuckerm.) Dewey. Its essential bibliography is: *C. vitilis* a. spiculis virescentibus Fries, Mant. iii. 137 (1842). *C. canescens*, var. γ. *sphaerostachya* Tuckerm. Enum. Meth. 10, 19 (1843). *C. sphaero-*

stachya (Tuckerm.) Dew. Am. Journ. Sci. xlix. 44, t. Ee, fig. 110 (1845). *C. vitilis* b. *sylvatica* Meinsh. Fl. Ingr. 402 (1878). *C. canescens*, var. *vulgaris* Bailey, Bot. Gaz. xiii. 86 (1888). *C. brunnescens gracilior* Britton in Britt. & Brown, Ill. Fl. i. 351 (1896).

C. RUPESTRIS All. Dominant on limestone, western Newfoundland, south to Bay St. George. See p. 62.

C. NOVAE-ANGLIAE Schwein. Turfy and silicious rocky slope of Joan Plains Hill, Bay Bulls, *Fernald, Long & Dunbar*, no. 26,417, the first from the Avalon Peninsula. See p. 85.

C. UMBELLATA Schkuhr. Barren silicious crests of Joan Plains Hill, Bay Bulls, *Fernald, Long & Dunbar*, no. 26,414; seen but not collected at Trepassey; the first stations on the Avalon Peninsula. See pp. 84, 85.

C. PEDUNCULATA Muhl. Woods and thickets on Bard Harbor Hill, Highlands of St. John and on St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, nos. 27,647, 27,648; extensions northward from Bay of Islands.

C. CONCINNA R. Br. Shaded limestone ledges and escarpments, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,649, the only Newfoundland station except Mackenzie & Griscom's on Cape St. George. See pp. 101, 102.

C. GLACIALIS Mackenzie. Dominant on limestone gravel in western Newfoundland from Quirpon to Bay St. George. See pp. 62, 79, 103, 121.

C. EBURNEA Boott. Shaded limestone ledges and escarpments, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,659; mossy coniferous woods, lower southwestern slope of Bard Harbor Hill, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,660; extensions north from Bay of Islands.

C. BICOLOR All. Wet depressions and margins of rills and pools in the limestone barrens, generally distributed from Pistolet Bay to Ingornachoix Bay, the only known region for the species in America. See pp. 76, 91, 105, 118.

C. LIVIDA (Wahlenb.) Willd. See Fernald, RHODORA, XXVIII. 8 (1926). Turfy limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,672, the only known station outside northern Europe and Alberta. See p. 102.

C. LIVIDA, var. RUFINAEFORMIS Fernald, l. c. (1926). Wet muddy hollow in limestone gravel-barren, Four-Mile Cove, *Fernald, Wiegand & Long*, no. 27,637 (TYPE of the var.). See p. 108.

× CAREX **quirponensis**, n. hybr. (*C. atratiformis* × *Halleri*), laxe caespitosa; culmis 2–6 dm. altis rigidulis superne acute angulatis scabrisque basi vaginis aphyllis atropurpureis deinde fibrillosis obtectis; foliis culmo valde brevioribus 2–4 mm. latis laete viridibus;

spicis 2–4 ellipsoideis 0.7–1.3 cm. longis 4–6 mm. crassis, lateralibus breviter pedunculatis subapproximatis vel imo remotiusculis adscendentibus, terminalibus majoribus gynaecandris; squamis late ovatis obtusis vel subacutis atropurpureis margine plus minusve anguste albo-hyalinis; perigyniis vacuis ovatis planis 3 mm. longis dense papillosis enerviis stramineis apice purpurascentibus.—NEWFOUNDLAND: abundant as scattered clumps on the turfy and rocky western slope of Cape Dégrat, Quirpon Island, August 7, 1925, *Fernald & Long*, no. 27,696 (TYPE in Gray Herb.)

Although abundant over a large area on the eastern half of Quirpon Island (See p. 121), *Carex quirponensis* is here described as a hybrid because in all the scores of clumps we examined no good achenes could be found and because it is an exact blend of *C. atratiformis* Britton and *C. Halleri* Gunn. (*C. alpina* Sw.), both of which are dominant and very fertile species from Cape Onion to Cape Bauld and Cape Dégrat. A very similar hybrid of *C. atrata* and *C. Halleri* (× C. *Candriani* Kneucker) is known in Europe.

C. HALLERI Gunn. Dominant in turf or on crests of slate or trap cliffs, eastern end of the Straits Coast: Little Quirpon, *Fernald & Long*, no. 27,697; Quirpon Island, *Wiegand, Gilbert & Hotchkiss*, no. 27,698; Mauve Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,701; Cape Onion, *Fernald*, no. 27,700; Anse aux Sauvages, *Fernald, Wiegand & Long*, no. 27,699; new to Newfoundland. See pp. 121, 123.

C. STYLOSA C. A. Meyer. Springy and seepy slopes in peaty barrens among the gneiss hills, Port aux Basques, *Fernald, Long & Dunbar*, no. 26,385 (collected in the same region, and then new to Newfoundland, by *Curtis & Lunt*, in 1912); abundant in damp quartzite gravel or in turf, summit-barrens of Bard Harbor Hill, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,702, *Wiegand, Gilbert & Hotchkiss*, no. 27,703, *Fernald & Long*, no. 27,704; mossy brooksides and turfy slopes, Sacred Island, *Wiegand, Gilbert & Hotchkiss*, no. 27,707, *Fernald & Long*, no. 27,708; turfy and rocky slopes of Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 27,705. See pp. 56, 110, 121.

C. RIGIDA Good. Although common on the bare crests of southwestern Newfoundland, *C. rigida* seems to be rare north of Bonne Bay, a single station: turfy and mossy quartzite rocks along Mans Humbug Brook, Highlands of St. John, *Fernald & Long*, no. 27,711. See p. 56.

C. LENTICULARIS Michx., var. ALBI-MONTANA Dewey. Wet quartzite rocks and gravel along brook, Southwest Gulch, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,719, new to Newfoundland. See p. 124.

C. SALINA Wahlenb. The small typical form of the species, with short scales is common on saline shores along the Straits.

C. SALINA, var. PSEUDOFILIPENDULA (Blytt) Kükenth. As noted on p. 122, this variety occurs on the Labrador side of the Straits and on the Gaspé coast. A plant from the boggy barren south of Ship Cove (*Fernald, Wiegand & Long*, no. 27,732) is an exact match for Scandinavian material cited by Kükenthal as *C. aquatilis* × *C. salina*, var. *pseudofilipendula*, so that the presence in the region of var. *pseudofilipendula* may be inferred.

C. HOSTIANA DC., var. LAURENTIANA Fern. & Wieg. Glades in spruce swamp, Brig Bay, *Fernald, Long & Dunbar*, no. 26,445, an extension north from Bay of Islands. See p. 79.

C. OEDERI Retz., var. SUBGLOBOSA (Mielich.) Richter. In clay mixed with limestone gravel, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,733. This and material from Pointe Riche (*Fernald & Wiegand*, no. 2912) is all we know from America. See p. 119.

C. LEPIDOCARPA Tausch. Wet calcareous soil on the West Coast, northward to the Straits. See p. 118.

C. MICROGLOCHIN Wahlenb. Dominant on peaty limestone barrens and in wet tundra, from Pistolet Bay to St. John Bay. See pp. 53, 61, 79, 118.

C. VESICARIA L., var. RAEANA (Boott) Fern. Boggy barren ("mesh"), south of Ship Cove, *Fernald, Wiegand & Long*, no. 27,758, the only Newfoundland station yet known except on the lower Humber. See p. 122.

JUNCUS EFFUSUS L., var. PYLAEI (Laharpe) Fern. & Wieg. Bushy swale on flat north of Doctor Hill, St. John Bay, *Fernald & Wiegand*, no. 27,764, the first station north of Bay of Islands. See p. 127.

J. BULBOSUS L. Cold brooks, spring-rills, margins of pools, etc., Trepassey, *Fernald, Long & Dunbar*, nos. 26,482, 26,483, and Bay Bulls, no. 26,484; extensions south from the northern Avalon Peninsula. See pp. 50, 81, 83.

J. ALPINUS Vill., var. UNI-BICEPS Laestad. Wet depressions and borders of pools in limestone barrens and tundra, Cook Point, *Fernald, Gilbert & Hotchkiss*, no. 27,779; Burnt Cape, *Fernald & Long*, no. 27,777; St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, nos. 27,774, 27,776; the first records from America.

J. ALBESCENS (Lange) Fernald. Dominant on wet calcareous barrens from Quirpon to Bay St. George. See pp. 62, 118.

J. STYGIUS L., var. AMERICANUS Buchenau. Frequent or common southward but rare northward: bare wet peat in depressions in limy bog-barrens, Flower Cove, *Fernald, Long & Dunbar*, no. 26,498; pools in tundra, central valley of Quirpon Island, *Fernald & Long*, no. 27,792; the first stations north of Bonne Bay.

LUZULA SPICATA (L.) DC. Abundant along the Straits from Pistolet Bay eastward; also on the Highlands of St. John. Previously known only locally from the East Coast. See p. 110.

L. CAMPESTRIS (L.) DC., var. COMOSA (Meyer) Fern. & Wieg.

Dry spruce thickets, Curling, *Fernald, Long & Dunbar*, no. 26,499. All previous stations are on the East Coast.

L. CAMPESTRIS, var. CONGESTA (Thuill.) Meyer. Wet spruce thickets among the gneiss hills back of Port aux Basques, *Fernald, Long & Dunbar*, no. 26,500, the first from eastern America. See p. 56.

ALLIUM SCHOENOPRASUM L., var. **laurentianum**, n. var., a var. *sibirico* recedit floribus minoribus (8–10 mm. longis) intense coloratis; segmentis ovatis vel ovato-lanceolatis.—Near the Gulf of St. Lawrence, western Newfoundland, and locally across the continent. NEWFOUNDLAND: along Eddies Cove Brook, July 24, 1925, *Griscom*, no. 27,822; muddy depressions in gravelly limestone barrens one mile back of Savage Cove, July 14, 1925, *Fernald & Long*, no. 27,821; wet places, Flower Cove, July 23, 1921, *M. E. Priest*, no. T5; damp crevices and gravel of limestone, Rock Marsh, Flower Cove, July 30, 1924, *Fernald, Long & Dunbar*, no. 26,512; in clay mixed with limestone gravel, barrens, St. John's Island, July 31, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,824 (TYPE in Gray Herb.); turfy calcareous western slope under summit of Bard Harbor Hill, July 28, 1925, *Wiegand, Gilbert & Hotchkiss*, no. 27,823; dry limestone cliffs and talus, western face of Doctor Hill, August 24, 1925, *Fernald & Long*, no. 27,825; damp talus of limestone sea-cliffs, Pointe Riche, August 4, 1910, *Fernald & Wiegand*, no. 3069. QUEBEC: Restigouche River, Metapedia, July 23, 1904, *A. S. Pease*, no. 4448. NEW BRUNSWICK: in grass field, Casey's Cape, Kent Co., July 9, 1914, *F. T. Hubbard*. NEW YORK: bank of Black River, Watertown, July 3, 1857, *Wm. Boott*. MONTANA: Belton, Glacier National Park, September 17, 1921, *S. D. McKelvy*. OREGON: Wallawalla, *Tolmie*. WASHINGTON: Marcus, August 18, 1902, *Kreager*, no. 459.

In typical var. *sibiricum* (*A. sibiricum* L.) the perianths are 10–14 mm. long, usually with more attenuate segments and commonly paler (though sometimes intensely colored); and in this variety the pedicels are commonly rather elongated so that the well developed flowering umbels are 3.5–5 cm. in diameter. In var. *laurentianum* the short perianths are intensely colored, the segments commonly less attenuate than in var. *sibiricum* and the pedicels mostly short, the well developed flowering umbels being usually 2.3–3 (rarely –3.3) cm. in diameter. Some specimens from eastern Asia (Ochotsk Sea, *Small;* Amur, *Maximowicz*) apparently belong to var. *laurentianum* and in the note on p. 62 they were mistaken for true var. *sibiricum*.

STREPTOPUS OREOPOLUS Fernald, RHODORA, viii. 70 (1906). As noted on pp. 104, 116 and 124, this characteristic plant, heretofore known only from the mountains of Gaspé and Matane Cos., Quebec, occurs about Pistolet Bay and abounds in the gulches of Bard Harbor

Hill. In the latter area it fruits heavily, its berries, previously unknown, being slightly elongate as in *S. amplexifolius* (L.) DC. but of a dark cherry-red color as in *S. roseus* Michx.

IRIS SETOSA Pallas, var. CANADENSIS Foster, forma **pallidiflora**, n. f., floribus albescentibus, sepalis plus minusve caeruleo-tinctis.—NEWFOUNDLAND: turfy shore near Nameless Point, Flower Cove, August 2, 1925, *Fernald & Long*, no. 27,843.

A peculiarly attractive color-form of the usually deep blue-violet northern Iris; the petals and stigmas are white and the large sepals also white except for a faint bluish tinge.

CYPRIPEDIUM PARVIFLORUM Salisb., var. **planipetalum**, n. var., humile, 0.8–2.3 dm. altum; foliis 2–4 ellipticis vel ovatis 3–9 cm. longis 1.7–4.5 cm. latis; sepalis viridibus vel stramineis plus minusve purpureotinctis, superiori ovato 2.2–4 cm. longo 0.8–2.2 cm. lato apice acuto vix acuminato basi rotundato, inferioribus connatis minoribus; petalis stramineis vel purpurascentibus oblongo-lanceolatis planis 2.5–4 cm. longis 0.4–1 cm. latis; labello dorso-ventraliter compresso aureo-flavo 2–4 cm. longo; staminodio basi cordato.—Western NEWFOUNDLAND: turfy limestone barrens, northern half of Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,855; southern half of Burnt Cape, August 3, 1925, *Fernald & Long*, no. 27,857; peaty slopes of limestone barrens on the Highlands east of Big Brook, Straits of Belle Isle, July 16, 1925, *Fernald, Wiegand & Hotchkiss*, no. 27,854; peaty and bushy areas on limestone barrens one mile back of Savage Cove, Straits of Belle Isle, July 14, 1925, *Fernald & Long*, no. 27,851 (TYPE in Gray Herb.), 27,852 (aberrant individuals); mossy spruce thickets bordering limestone barrens near Ice Point, St. Barbe Bay, July 14, 1925, *Wiegand, Gilbert & Hotchkiss*, no. 27,853; turfy limestone barrens, St. John's Island, St. John Bay, July 31, 1925, *Fernald et al.* no. 27,856; Bay of Islands, July 5, 1906. *C. W. Townsend;* turfy slopes of the marble region between Mt. Musgrave and Humber Mouth, July 18, 1910, *Fernald, Wiegand & Kittredge*, no. 3096; highest summits of the Lewis Hills, July, 1911, *L. S. Sanford;* in humus or turf on the limestone tableland, alt. 200–300 m., Table Mountain, Port-à-Port Bay, July 16 & 17, 1914, *Fernald & St. John*, no. 10,815.

Var. *planipetalum* is distinguished from both *C. parviflorum* and *C. parviflorum*, var. *pubescens* (Willd.) Knight by its short and comparatively broad, flat, usually purplish petals, by the relatively shorter and broader upper sepal with less acuminate or elongate tip and with rounded rather than abruptly narrowed or subcuneate base, and by the cordate staminodium; *C. parviflorum* and its var. *pubescens* having the commonly paler petals linear to linear-lanceolate,

mostly spirally curled and 3.5–9 cm. long, the narrower upper sepal long-acuminate at tip and usually tapering at base, 2.5–5 cm. long in typical *C. parviflorum*, 5–8 cm. in var. *pubescens*. In typical *C. parviflorum* the staminodium is narrowed to subtruncate at base; in the large-flowered var. *pubescens* it is frequently subcordate, in this character approaching var. *planipetalum*. The plant of the Newfoundland barrens is low (mostly 1–2 dm. high) with only 2–4 (usually 3) dilated leaves below the bract; *C. parviflorum* and var. *pubescens* are taller and with 3–5 (usually 4) larger leaves. A battered specimen of Waghorne's from woods at Coal River, Newfoundland is typical *C. parviflorum* and specimens from the Mingan Islands, Anticosti, Gaspé and Alberta strongly approach var. *planipetalum* in having broad and flat petals but the staminodium not cordate as in the Newfoundland plant.

In its broad and flat petals *C. parviflorum*, var. *planipetalum* strongly suggests the Eurasian *C. Calceolus* L. and such a plate as that of Redouté, *Les Liliacécs*, i. t. 19 looks almost intermediate between *C. parviflorum* and var. *planipetalum;* and in some European specimens of *C. Calceolus* the staminodium shows a very strong tendency to be cordate at base. In both *C. Calceolus* and *C. parviflorum*, var. *pubescens*, however, the staminodium is longer-stalked than in true *C. parviflorum* and var. *planipetalum* and the sepals and petals of the Eurasian plant are more consistently purple than in the American series. They are very close, however, and it need not be surprising if, with better knowledge of the variations of the two series, the Eurasian and American plants are eventually treated as one polymorphous circumpolar species. See p. 95.

Orchis rotundifolia Pursh. Peaty or turfy depressions in limestone barrens, frequent, often very abundant, from Pistolet Bay westward to Sandy (Poverty) Cove; new to Newfoundland. See. pp. 97, 100, 103.

The Variations of Habenaria viridis.—*Habenaria viridis* (L.) R. Br. is not generally recognized as occurring outside the northern and mountainous regions of Eurasia, its American representives passing very generally as *H. bracteata* (Muhl.) R. Br. or as *H. viridis*, var. *bracteata* (Muhl.) Gray or, by those who treat the sections of Habenaria as genera, as *Coeloglossum bracteatum* (Muhl.) Parl.

The latter plant, with very long and divergent linear-lanceolate bracts is typical of the cooler sections of the Alleghenian and the

warmer sections of the Canadian regions of eastern America—from Newfoundland and Gaspé west to southern Alberta and south in rich woods and meadows to New Jersey, Pennsylvania, Ohio, Illinois and Iowa; and it also occurs in temperate eastern Asia (Japan, China, etc.). The plant of western America, from Alaska south to southern British Columbia, Colorado, the Black Hills and locally to Lake Huron, has the bracts broader, shorter and more ascending than in the common northeastern plant and in the Old World seems to be confined to extreme northeastern Asia. Superficially it resembles the European plant which there passes as *Coeloglossum viride*, var. *bracteatum* Richter, but it is not a good match for the eastern American plant which was first published as *Orchis bracteata* Muhl.[1]

The fact that the plant of western America is not satisfactory *Habenaria bracteata* or *H. viridis*, var. *bracteata* had long been apparent but, like most such questions, its proper working out had been left over until some more convenient moment. Now, however, with the necessity of settling satisfactorily the exact identity of the plant which abounds on the limestone shores and barrens on the south side of the Straits of Belle Isle in northwestern Newfoundland, it has seemed appropriate to review the plants which are passing in different regions as *Habenaria viridis* or *Coeloglossum viride*.

The typical plant of Europe and adjacent Asia, the plant first published as *Satyrium viride* L.,[2] has a comparatively lax raceme with the lowest bracts at most twice as long as the flowers, the middle and upper bracts decidedly shorter, the flowers varying from greenish to red (see for example the plate of *Platanthera viridis* in Reichenbach fil., Icones, xiv. t. 434). Its lip, as shown by about 80 individuals before me and by the European plates, is 3-toothed at apex, as regularly described, the middle tooth, though shorter than the two lateral ones, being well developed. Of somewhat rarer occurrence in Europe is an extreme development, with the bracts more prolonged, the lower 2–3 times as long as the flowers, the upper equaling or exceeding them; but in this long-bracted European plant the lip is like that of typical European *H. viridis* and the bracts are spreading-ascending. It is, apparently, only an extreme variation of the

[1] Muhl. in Willd. Sp. Pl. iv. 34 (1805).
[2] L. Sp. Pl. ii. 944 (1753).

European type and may be the plant which Linnaeus meant as *Satyrium viride*, β.:

"β. Orchis palmata batractites. *Bauh. pin. 86. Vaill. paris. 153. t. 31. f. 6, 7, 8.*"[1]

The Vaillant figures, however, show only details of the flowers and nothing of the raceme as a whole, while Bauhin gives no more satisfaction, except to carry the reference back to *Serapias Batrachites vel Myoides* of Lobelius, *Icones Stirpium*, where we find an excellent figure of the short-bracted typical *Habenaria viridis*. The long-bracted plant was perhaps meant by Tenore when he described *Orchis viridis*, β. *Vaillanti*[2] and Schur clearly described it as *Peristylus viridis* (L.) Lindl., b. *macrobracteata*,[3] from Transylvania, but in general it is treated in Europe as identical with the Alleghenian plant which Muhlenberg sent to Willdenow as *Orchis bracteata*.

In the latter plant not only are the long linear-lanceolate lower bracts strongly, often horizontally, divergent but the middle and upper are much more prolonged than in the long-bracted European plant. Furthermore, the ordinarily narrower (nearly linear) lip is usually only bifid at apex, the 3d or middle tooth which is prolonged in the European plant, usually being nearly or quite obsolete, just as originally described by Muhlenberg through Willdenow: "Labellum *lineare dependens, apice bifidum cum mucrone parvo obscuro inter lacinias, saepius deficiente.*" With its patent and very narrow bracts, its uniformly green or greenish (never highly colored) flowers and its usually narrower lip with the middle tooth ordinarily suppressed *Habenaria bracteata* would constitute a fairly distinct Alleghenian-eastern Asiatic species, were it not for the plant of western America, northeastern Asia and extreme northwestern Newfoundland, a plant with a range which is thoroughly typical and with characters which place it exactly between *H. bracteata* on the one hand and the long-bracted extreme of European *H. viridis* on the other.

The plant of northwestern Newfoundland, originally discovered there by Miss Mary E. Priest in July, 1921, found by Messrs. Long, Dunbar and me in August, 1924, and found in great quantity by our party of 1925, in habit is quite like the long-bracted European plant, *Orchis viridis*, var. *Vaillantii* Ten. or *Peristylus viridis*, var. *macrobracteata* Schur., the smallest specimens closely matching plants from

[1] L. Sp. Pl. ii. 944 (1753).
[2] Ten. Syll. Add. 629 (1831). I have been unable to see Tenore's original account.
[3] Schur, Enum. Pl. Transsilv. 645 (1885).

the Faroe Islands, the taller specimens strikingly like Reichenbach's plate of the long-bracted Bohemian plant; but of the 192 individuals before me while writing, the oblong to narrowly cuneate-oblong lip of all but three or four has the tip consistently with 2 broad and flat teeth and quite without the median tooth of the European plant. In very exceptional individuals the median tooth is developed, just as it is in exceptional individuals of *H. viridis*, var. *bracteata*. The smallest plants of northern Newfoundland are quite identical in all characters with material from northeastern Asia (Arakamtchetchene Island, Bering Straits, *Chas. Wright;* "in monticulo aprico saxoso," Ajan, Ochotsk Sea, *Tiling*); while the larger plants are quite like the plant of western America which has there passed as *H. bracteata*. This plant of western America has the lip almost uniformly 2-toothed at apex, with the median tooth obsolete, but in occasional individuals the 3d tooth is evident.

The whole series seems to form a polymorphous circumpolar species, the American and eastern Asiatic varieties with the lip generally 2-toothed, the European with it more consistently 3-toothed; but with enough departures in the American series to indicate that the plants are not specifically separable.

The conclusions reached in this study are summarized below.

HABENARIA VIRIDIS (L.) R. Br. in Ait. Hort. Kew. ed 2, v. 192 (1813). *Satyrium viride* L. Sp. Pl. ii. 944 (1753). *Orchis viridis* (L.) Crantz, Stirp. ed. 2: 491 (1769). *Coeloglossum viride* (L.) Hartm. Handb. 329 (1820). *Platanthera viridis* (L.) Lindl. Synop. Brit. Fl. 261 (1829). *Himantoglossum viride* (L.) Reichenb. Fl. Excurs. 119 (1830). *Peristylus viridis* (L.) Lindl. Synop. Brit. Fl. ed. 2: 261 (1835). *Peristylus viridis*, b. *gracillima* Schur, Enum. Pl. Transsilv. 645 (1885). For further synonymy see Richter, Pl. Eu. i. 277 (1890).—Raceme rather lax: lowest bracts equaling to twice as long as the flowers: middle and upper bracts shorter than the flowers: flowers green or yellowish varying to red: lip distinctly 3-toothed at apex; the middle tooth prolonged but shorter than the lateral.—Europe and western Asia.

Var. **Vaillanti** (Ten.), n. comb. *Orchis viridis*, β. *Vaillanti* Ten. Syll. Add. 629 (1831). *H. bracteata* of European authors, not *Orchis bracteata* Muhl. *Platanthera viridis*, var. *bracteata* Reichenb, f. Ic. xiv. 130, t. 435, fig. 1 (1851) not *Orchis bracteata* Muhl. *Coeloglossum bracteatum* Parl. Fl. Ital. iii. 409 (1858) as to plant, not as to name-bringing synonym, *Orchis bracteata* Muhl. *C. viride*, b. *bracteatum* Richter, Pl. Eu. i. 278 (1890) as to plant, not *Orchis bracteata* Muhl. *Peristylus viridis*, b. *macrobracteata* Schur, Enum. Pl. Transsilv. 645 (1885).—Raceme commonly denser, often more elongate: lower

bracts 2–3 times as long as the flowers, spreading-ascending; upper bracts equaling or exceeding the flowers: lip 3-toothed at apex.—Europe and adjacent Asia.

Var. **interjecta**, n. var., 0.5–3.5 dm. alta; foliis 2–5, inferioribus oblongis vel oblongo-obovatis apice rotundatis, superioribus oblongo-lanceolatis acutis; racemo subcapitato deinde longe cylindrico 0.2–1.7 dm. longo; bracteis subadscendentibus, inferioribus lanceolatis vel anguste ovatis floribus dimidio-triplo longioribus, mediis superioribusque floribus brevioribus vel paulo longioribus; floribus viridibus; labio oblongo vel oblongo-cuneato apice bidentato dentibus oblongis vel deltoideis, dento intermedio obsoleto vel rare producto.—Northwestern Newfoundland; Michigan; Alaska to South Dakota, Colorado and southern British Columbia; northeastern Siberia. NEWFOUNDLAND: turfy limestone barrens, northern half of Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,872; turfy limestone barrens, Cook Point, Pistolet Bay, July 18, 1925, *Fernald & Gilbert*, no. 27,873; Cook Point, August 13, 1925, *Fernald, Gilbert & Hotchkiss*, no. 27,876; turfy limestone barrens, Boat Harbor, Straits of Belle Isle, July 19, 1925, *Fernald, Wiegand & Long*, no. 27,874; turfy limestone slope near the sea, Four-mile Cove, Straits of Belle Isle, July 20, 1925, *Fernald, Long & Wiegand*, no. 27,875; gravelly and peaty limestone barrens back of Big Brook, Straits of Belle Isle, July 15, 1925, *Fernald & Long*, no. 27,869; turfy and peaty slopes of limestone escarpment east of Big Brook, July 15, 1925, *Wiegand, Gilbert & Hotchkiss*, no. 27,868; turfy limestone slopes east of Big Brook, July 16, 1925, *Fernald, Wiegand & Hotchkiss*, no. 27,870 (TYPE in Gray Herb.); mossy knolls in tundra back of Big Brook, July 16, 1925, *Pease & Griscom*, no. 27,871; on knolls of *Empetrum nigrum*, *Salix reticulata*, etc., Sandy (or Poverty) Cove, August 1, 1924, *Fernald, Long & Dunbar*, no. 26,532; July 12, 1925, *Fernald & Griscom*, no. 27,865; turfy border of gravelly limestone beach, Savage Point, July 13, 1925, *Fernald, Wiegand, Pease, Long, Gilbert & Hotchkiss*, no. 27,867; damp limestone barrens, Yankee Point, July 12, 1925, *Wiegand & Hotchkiss*, no. 27,866; turfy and gravelly limestone strand, Yankee Point, August 16, 1925, *Fernald, Wiegand & Long*, no. 27,877; barrens, Flower Cove, July 15, 1921, *M. E. Priest.* MICHIGAN: Macinac Island, July 12, 1915, *W. H. Manning* (transition to var. *bracteata*). MANITOBA: Lake Winnipeg Valley, 1857, *Bourgeau.* SOUTH DAKOTA: under willows, on slaty soil, edge of Bald Hills, June 5, 1910, *J. Murdock, jr.*, no. 4064. SASKATCHEWAN: Moose Mountain, July 3, 1880, *J. Macoun*, no. 173. ALBERTA: prairie slough, Calgary, June 19, 1903, *M. A. Barber*, no. 192; Banff, July 11, 1891, *Macoun*, no. 2827, July, 1906, *S. Brown*, no. 157. WYOMING: wet woods, Black Hills, July 25, 1910, *A. Nelson*, no. 9506 (as *Limnorchis borealis*). COLORADO: meadow, vicinity of Long's Peak, Larimer Co., August 21, 1914, *F. W. Hunnewell, 2nd.* BRITISH COLUMBIA: woods near

Emerald Lake, Selkirk Mts., July 4, 1904, *H. Petersen*, no. 75; Cascade Mts., lat. 49°, 1859, *Lyall*. ALASKA: Disenchantment Bay, August 12, 1892, *Funston*, no. 112; Kodiak, July 24, 1904, *Piper*, no. 4438. SIBERIA: Arakamtchetchene Island, Bering Straits, 1853–56, *C. Wright;* "in monticulo aprico saxoso," Ajan, 1851, *Tiling*. See pp. 54, 76, 91, 105.

Var. BRACTEATA (Muhl.) Gray, Man. ed. 5: 500 (1867). *Orchis bracteata* Muhl. in Willd. Sp. iv. 34 (1805). *O. bractealis* Salisb. Paradis. t. 110 (1806–7). *Satyrium bracteatum* (Muhl.) Pers. Syn. ii. 507 (1807). *S. bracteale* Salisb. Trans. Hort. Soc. i. 290 (1812). *H. bracteata* (Muhl.) R. Br. in Ait. Hort. Kew. ed. 2, v. 192 (1813). *Peristylus bracteatus* Lindl. Gen. & Sp. Orch. 298 (1835). *Platanthera bracteata* (Muhl.) Torr. Fl. N. Y. ii. 279 (1843). *Coeloglossum bracteatum* (Muhl.) Parl. Fl. Ital. iii. 409 (1858), as to name-bringing synonym. *Platanthera viridis*, var. *bracteata* (Muhl.) Reichenb. f. Icon. xiv. 130, as to name-bringing synonym. —1.3–4.5 dm. high: raceme lax, 0.3–1.8 dm. long: bracts linear-lanceolate, divergent; the lower and median 2–4 times as long as the green flowers; the uppermost equaling to twice as long as the flowers: lip linear to oblong, 2-toothed at apex, rarely with an intermediate short tooth.—Woods and meadows, Newfoundland to southern Alberta, south to New Jersey, Pennsylvania, Ohio, Illinois and Iowa; Japan, China, etc.

HABENARIA **straminea**, n. sp., *H. albidae* similis; caulibus 1–3.4 dm. altis; foliis inferioribus 2–4 oblongo-obovatis obtusis vel subacutis 2–7 cm. longis 0.8–3.5 cm. latis basi supravaginali cuneatis, superioribus minoribus acuminatis in bracteas decrescentibus, omnibus internodiis subaequalibus; spicis cylindricis plurifloris densis (floribus inferioribus subremotis) 3–10 cm. longis 1.2–2 cm. crassis; bracteis lanceolatis acuminatis ovariis duplo longioribus; ovariis fusiformibus anthesi tortis 4–6 mm. longis; sepalis stramineis anguste ovatis apicem versus plus minusve attenuatis tenuibus valde 3-nervatis 2.7–4 mm. longis; petalis lateralibus anguste ovatis apicem versus angustatis tenuibus valde 3–5-nervatis sepala vix aequantibus; labello submembranaceo 3–5 mm. longo late cuneato trifido lobis lanceolato-deltoideis subaequalibus valde 2–3-nervatis; calcare cylindrico-clavato obtuso 2–3 mm. longo.—Newfoundland, Greenland, Iceland and the Faroe Islands. NEWFOUNDLAND: turfy limestone barrens, northern half of Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 27,889; peaty and turfy glades and open slopes, Schooner (or Brandy) Island, Pistolet Bay, July 18, 1925, *Pease & Long*, no. 27,891; moist turfy or peaty depressions in limestone barrens, Cook Point, Pistolet Bay, July 18, 1925, *Fernald & Gilbert*, no. 27,890; boggy depressions in limestone barrens, Cape Norman, July 18, 1925, *Wiegand, Griscom, & Hotchkiss*, no. 27,892 (TYPE in Gray Herb.), August 13, 1925, *Wiegand & Long*, no. 27,895; turfy limestone barrens, Four-Mile Cove, Straits of Belle Isle, July 20, 1925, *Fernald, Wiegand & Long,*

no. 27,893; depressions in tundra one mile back of Savage Cove, Straits of Belle Isle, July 23, 1925, *Fernald, Pease & Long*, no. 27,894. GREENLAND: Julianehaab, 1859, *Rink;* Skansen, Disco, July 8, 1921, *E. A. Porsild;* Disco, 1870, *Berggren;* rich damp soil by brook, Godhavn, August 4, 1878, *Krumlein;* Knanersok, lat. 62°, July 11, 1889, *Hartz; ca.* Neria, lat. 61° 33′, July 8, 1924, *Eugenius.* ICELAND: Reykjahlid, July 25, 1895, *Elizabeth Taylor.* FAROE ISLANDS: Mornafjeld Videro, July 11, 1905, *Elizabeth Taylor.*

The material of *Habenaria straminea* from Greenland, Iceland and the Faroe Islands has regularly passed as *H. albida* (L.) R. Br. From that European species it differs, however, in its thicker spike (in *H. albida* only 0.7–1.3 cm. thick); longer bracts (in *H. albida* rarely much overtopping the ovary); stramineous sepals which are narrower, longer and thinner and with more evident nerves (in *H. albida* the firm white or whitish sepals 2–3 mm. long, with only the midnerve prominent); longer thinner and definitely nerved petals; longer and thinner clearly nerved lip (in *H. albida* the firm and thick yellowish lip about 2 mm. long and opaque to transmitted light); and longer spur.

In *H. straminea,* as found in northwestern Newfoundland, the flowers have a delicious fragrance suggestive of vanilla and Krumlein noted that the Greenland plant has "Fl. pale greenish yellow, sweet scented." Whether the fragrance is different from that of *H. albida* I cannot say. In *H. albida* the short lip is described as horizontal or projected forward. In the herbarium-material of *H. straminea* it is often slightly drooping; whether this character is diagnostic cannot be settled without fresh material. See pp. 102, 105, 106.

HABENARIA OBTUSATA (Pursh) Richardson, var. **collectanea**, n. var., a var. typica recedit racemo 1–4.5 cm. longo floribus approximatis vel subapproximatis; scapo quam folio breviori vel eo paulo superante.—Labrador, western Newfoundland, eastern Quebec, northern Manitoba and Alaska. LABRADOR: Indian Harbor, Hamilton Inlet, August 2, 1891, *Bowdoin College Exped.* no. 198; Red Bay, July 4, 1892, *Sornberger,* no. 74; springy banks and damp hillsides, Forteau, July 30, 1910, *Fernald & Wiegand,* no. 3112; gravelly thicket back of strand, Blanc Sablon, August 4, 1910, *Fernald & Wiegand,* no. 3114 NEWFOUNDLAND: mossy brooksides and damp turfy slopes, Sacred Island, Straits of Belle Isle, August 10, 1925, *Fernald & Long,* no. 27,899; mossy and turfy trap cliffs and talus, Anse aux Sauvages, Pistolet Bay, August 11, 1925, *Fernald, Wiegand & Long,* no. 27,900; gravelly and peaty limestone barrens back of Big Brook, July 15, 1925, *Fernald & Long,* nos. 27,897, 27,901; open woods, Flower Cove, July 26, 1921, *Mary E. Priest;* turfy limestone barrens, St. John's

Island, July 31, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,898 (TYPE, in Gray Herb.); damp talus of limestone sea-cliffs, Pointe Riche, August 4, 1910, *Fernald & Wiegand*, no. 3115. QUEBEC: mossy evergreen woods, Goynish, July 5, 1915, *St. John*, no. 90,335; sur les rivages calcaires, Ile à Marteau, Archipel de Mingan, Juillet 15, 1924, *Marie-Victorin & Rolland-Germain*, no. 18,763. MANITOBA: Churchill, lat. 58° 50′, July 26, 1910, *J. M. Macoun*, no. 79,195. ALASKA: Nagai Island, Shumagin Islands, August 1, 1872, *M. W. Harrington*.

In its crowded raceme *H. obtusata*, var. *collectanea* strongly simulates *H. clavellata*, but in all technical characters it is clearly an extreme of *H. obtusata*. In the typical form of the species, a woodland plant, the flowers are remote, forming a loosely alternate-flowered slender raceme which (except in the smallest specimens) is 5–17 cm. long; and the scape usually much exceeds the leaf. See p. 92.

HABENARIA LACERA (Michx.) R. Br., var. TERRAE-NOVAE Fernald. For discussion see RHODORA, xxviii. 21 (1926); also p. 57.

CORALLORHIZA ERICETORUM Drejer. One plant at border of spruce thicket on limestone barren south of Flower Cove, *Pease, Long, & Gilbert*, no. 27,920; two plants in tundra back of Big Brook, *Pease & Griscom*, no. 27,922; one plant in boggy tundra, Schooner (Brandy) Island, *Pease & Long*, no. 27,923; new to America. See p. 93.

MALAXIS **brachypoda** (Gray), n. comb. *Microstylis brachypoda* Gray, Ann. Lyc. Nat. Hist. N. Y. iii. 227 (1835). *Mal. monophyllos* of eastern American authors, not (L.) Sw. *Mic. monophyllos* of eastern American authors not (L.) Lindl.

In his younger days, when he was closely studying plants in the field, Asa Gray clearly understood the distinctions between the plant of eastern North America and *Malaxis monophyllos* (L.) Sw. or *Microstylis monophyllos* (L.) Lindl. of Eurasia; but, overwhelmed apparently by the opinions of Hooker, Lindley, and Torrey, he abandoned his species and, so far as I can find, no one has subsequently suggested that our plant and the Eurasian are not identical. The two are, however, thoroughly distinct; their contrasts are indicated below.

M. MONOPHYLLOS. Flower-bud just before expanding ovate-lanceolate, 2–3 mm. long: pedicel and ovary during anthesis 2.5–4 mm. long: expanded perianth 4–6.5 mm. broad: flower resupinate, the lip and lateral sepals subconnivent and projected forward: capsules 5–7 mm. long, on twisted pedicels 3–5 mm. long, crowned by the subconnivent ascending perianth-segments.

M. BRACHYPODA. Flower-bud just before expanding ovate, 1.5–2 mm. long: pedicel and ovary during anthesis 1.5–3 mm. long: expanded perianth 3–5 mm. broad: perianth-segments (including the lip)

strongly divergent, perpendicular to the axis of the ovary, finally reflexed and appressed to the ovary, the lip drooping: capsules 3–5 mm. long, on straight pedicels 1–2 mm. long, crowned by the reflexed and appressed perianth-segments. See p. 92.

Malaxis diphyllos Cham. Linn. iii. 34 (1829) from Unalaska is the Eurasian *M. monophyllos*. This is indicated by Chamisso's description of it as having "Flores exacte *M. monophylli*, . . . labellum . . . , erectum"; and by the figure of Chamisso's material published by Reichenbach fil. Ic. Fl. Germ. et Helv. xiii & xiv. t. ccccxciii. fig. iii (1851). In *M. brachypoda* the raceme tends to be shorter than in *M. monophyllos*, though the median measurements overlap. In the 16 specimens of the latter before me the inflorescences range from 2–14 cm. in length, with an average length of 7.3 cm. Ten times that number of specimens (161) of *M. brachypoda* show a range from 1–11.5 (av. 4.5) cm.

Calypso bulbosa (L.) Oakes. Mossy spruce woods, very scarce, north of Doctor Hill and on western slope of Bard Harbor Hill, St. John Bay, *Fernald & Long*, nos. 27,930, 27,931; new to Newfoundland. See p. 125.

Salix lucida Muhl. Thickets along East Brook, St. Barbe Bay, *Wiegand & Hotchkiss*, no. 27,932, our only Newfoundland collection from north of the Humber.

S. reticulata L. Dominant and very variable on calcareous barrens and slopes from Quirpon to Ingornachoix Bay; leaves varying from oblong to orbicular and from 0.5–4.5 cm. long. See pp. 53, 59, 62, 79, 118.

S. vestita Pursh. Dominant on calcareous slopes and barrens from Quirpon to Bay St. George. See pp. 75, 79, 117.

S. herbacea L. Mossy shelves of slaty cliffs, upper Deer Pond Brook, Highlands of St. John, *Fernald & Long*, no. 27,954, the first station in Newfoundland. See p. 124.

Salix **jejuna**, n. sp., frutex depressus *S. anglorum* simulans; ramulis repentibus gracilibus glabris olivaceis vel badiis; foliis breviter oblongis vel late ellipticis apice basique subacutis vel rotundatis coriaceis 0.6–2.5 cm. longis 0.2–1.8 cm. latis integris utrinque glabris vel laxe villosis glabratisque reticulatis supra viridibus lucidis subtus glaucescentibus; petiolis 1–5 mm. longis superne sulcatis glabris; stipulis rare evolutis lineari-lanceolatis pilosis 1.5–2.5 mm. longis; gemmis ovoideis obtusis glabris badiis vel stramineis ad 3.5 mm. longis; amentis fructiferis 0.6–1.8 cm. longis 7–9 mm. crassis ramulos foliatos 0.4–2 cm. longos plus minusve pilosos terminantibus; bracteis oblongo-obovatis fuscis vel purpurascentibus sericeo-pilosis vel apice glabratis 1–1.7 mm. longis; capsulis conico-ovoideis obtusis 3–4 mm. longis dense villoso-tomentosis vel glabratis sessilibus vel subses-

silibus; stylo distincto ad 0.3 mm. longo apice bifido stigmata bifida subaequanti; glandula bractea breviore.—Straits of Belle Isle, Labrador and Newfoundland. LABRADOR: Henley Island, Chateau Bay, September 7, 1923, *A. G. Huntsman*. NEWFOUNDLAND: dry rocky and gravelly limestone barrens, Cape Norman, July 18, 1925, *Wiegand, Griscom & Hotchkiss*, no. 27,947, August 13, 1925, *Wiegand & Long*, no. 27,950 (TYPE in Gray Herb.); gravelly limestone barren, Four-Mile Cove, Straits of Belle Isle, July 20, 1925, *Fernald, Wiegand & Long*, no. 27,949; limestone sea-cliffs east of Big Brook, July 16, 1925, *Fernald, Wiegand & Hotchkiss*, no. 27,986. See p. 100.

Salix jejuna is as yet known only in mature fruit. At all the Newfoundland stations it was a very insignificant shrub, forming mats only 0.3–2 dm. across and closely associated with the wholly different *S. calcicola* Fern. & Wieg. In its largest extreme it resembles small shrubs of *S. anglorum* var. *kophophylla* Schneider of the serpentine areas about Bonne Bay and the Bay of Islands, Newfoundland and of Mt. Albert, Quebec; but it is at once distinguished by its tiny fruiting aments, extraordinarily short capsules and short style; *S. anglorum* and its varieties having fruiting aments 3–5 cm. long, capsules 7–8 mm. long and styles comparatively long (toward 1 mm. or even 1.5 mm.). Typical arctic *S. anglorum* reaches its southern limit in Labrador at latitude 55°,—250 miles (400 km.) north of the Straits. Southward *S. anglorum* is represented by three varieties which are confined to serpentine barrens of western Newfoundland and Gaspé; *S. jejuna*, however, in all its Newfoundland stations is on limestone and 180 miles (290 km.) northeast of the nearest known station of *S. anglorum*, var. *kophophylla*.

S. ARCTOPHILA Cockerell. Dominant in damp tundra or on peaty knolls in limestone barrens from Pistolet Bay to St. Barbe Bay, our only other record being from Table Mt., Port-à-Port Bay. See pp. 53, 62, 118.

SALIX ARCTOPHILA Cockerell, forma **lejocarpa** (And.), n. comb. *S. arctica*, γ *groenlandica*, var. *lejocarpa* And. in DC. Prodr. xvi. pt. 2: 287 (1868). *S. groenlandica*, forma *lejocarpa* (And.) Lange, Consp. Fl. Groenl. i. 108 (1880). *S. arctophila*, var. *lejocarpa* (And.) Schneider, Bot. Gaz. lxxvii. 57 (1919).

The plant is surely not a geographic variety but merely a form, colonies of it occurring scattered through the range of the typical form, which has lightly pubescent capsules.

(*To be continued.*)

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND.

M. L. Fernald.

(*Continued from p. 178.*)

Salix cordifolia Pursh. *S. cordifolia* is the most variable willow of northwestern Newfoundland, Labrador, the Mingan Islands and the Shickshock Mountains. As already pointed out by Schneider,[1] it includes most of the material which has passed in eastern America as *S. glauca* L.; but so very diverse are the extremes in the American series that it is quite unsatisfactory to treat them, as is done by Schneider, merely as two varieties. For instance, such a shrub as that originally described by Pursh, with broadly ovate cordate-based leaves and densely villous stout branchlets, is not satisfactorily treated as identical with *S. callicarpaea* Trautvetter, well illustrated and clearly described, with elliptic to narrowly ovate leaves rounded to attenuate at base. Nor are these satisfactorily identified with the large shrub occurring along the Straits of Belle Isle, with slender glabrous branchlets and glabrous obovate leaves up to 9 cm. long and 5 cm. broad, nor with another shrub, of depressed habit, with pubescent branchlets and orbicular to short-oblong round-tipped leaves only 0.7–2 cm. broad. Yet it has thus far been impossible to find any characters of the aments which are at all concomitant with the variations of pubescence and foliage; and, although the extremes are well marked and practically all material can be sorted definitely into six varieties, there are frequent transitional specimens. It is, however, more satisfactory to have for these stronger tendencies of the species definite varietal names than to force the shrubs into

[1] Schneider, Bot. Gaz. lxvi. 343 (1918).

the two or three categories provided by Schneider.[1] As a tentative classification of the American varieties of *S. cordifolia* the following arrangement is proposed. Owing to almost complete lack of knowledge of the Greenland forms of this group it has been necessary to restrict the study to the shrubs of Labrador, Newfoundland and Quebec; and eventually, when the Greenland types are properly studied, some of the varietal names here used may have to be displaced.

a. New branchlets and young leaves more or less densely villous or sericeous *b*,
  b. Leaves of fruiting branches oval to ovate or obovate, cordate to rounded at base, mostly 3–7 cm. long..... Var. *typica.*
  b. Leaves of fruiting branches not cordate, if rounded at base mostly smaller or narrower *c.*
    c. Mature leaves mostly 2.5–6 cm. long, oblanceolate, oblong, elliptic or narrowly obovate.
      Leaves glabrate in maturity or merely a little silky on the nerves beneath.....Var. *callicarpaea.*
      Leaves permanently and rather densely villous....Var. *intonsa*
    c. Mature leaves mostly only 1–2.5 cm. long, orbicular to short-oblong or narrowly obovate
      Leaves elliptic, oblong or narrowly obovate, acute or acutish.....Var. *Macounii.*
      Leaves orbicular to short-oblong, rounded at summit Var. *eucycla.*
a. New branchlets and young leaves glabrous or essentially so; leaves obovate, 2–5 cm. broad.....Var. *tonsa.*

S. CORDIFOLIA, var. **typica**, n. var. *S. cordifolia* Pursh, Fl. Am. Sept. ii. 611 (1814); Forbes, Salict. Wob. 277, fig. 143 (1829). *S. labradorica* Rydb. Bull. N. Y. Bot. Gard. i. 274 (1899) as to description, not as to later designated type.—Depressed or ascending, up to 0.5 m. high; branchlets rather stout, silky-villous: leaves of the fruiting branches oval to ovate or slightly obovate, cordate, subcordate or rounded at base, acuminate to obtuse; the fully grown 2.5–7 cm. long, 2–4.5 cm. broad, more or less silky-villous on both surfaces, sometimes becoming nearly or quite glabrate; leaves of the sprouts larger, thinner and often more strongly cordate.—The following specimens have been examined. LABRADOR: Henley Harbor, August 15, 1923, *A. G. Huntsman.* NEWFOUNDLAND: dryish limestone talus, western face of Doctor Hill, Highlands of St. John, August 24, 1925, *Fernald & Long*, nos. 27,977, 27,978; dry rocky limestone barrens, near sea-level, Ingornachoix Bay, August 1, 1910, *Fernald & Wiegand*, no. 3219.

Pursh's description of *Salix cordifolia* was very definite:

[1] Schneider treats *S. atra* Rydb. as a form and, although reducing the comparatively distinct *S. callicarpaea* Trauttv. and *S. labradorica* Rydberg, proposes *S. cordifolia* forma *hypoprionata* for the individuals of whatever leaf-outline and pubescence which exhibit a slight denticulation on some of the margins.

"S. depressa; foliis ovalibus subacutis basi cordatis integerrimis reticulato-venosis supra glabris, subtus pallidis nervo margineque pilosis, stipulis semicordatis.
In Labrador. ♄. *v. v. s. fl. in Hort. Anderson.* In general habit it resembles *S. myrsinites.*"

Such a description might have been drawn from any of the numbers above cited and it certainly seems right to identify with Pursh's description the shrub which really has oval and cordate leaves. Rydberg, apparently ignoring Pursh's description or laying more emphasis than seems justified upon the permanence of the pubescence, redescribed *S. cordifolia* as a new species, *S. labradorica,* with "young shoots more or less densely villous; leaves broadly ovate, often obtuse or subcordate at the base, rather firm, dark and glossy above, more or less glaucous beneath, on both surfaces invested with white villous hairs." But it is impossible to reconcile with Rydberg's description, "leaves broadly ovate, often obtuse or subcordate at the base," the specimen from Turner's Head, Labrador, which has been designated in the Columbia College Herbarium as the "type" of *S. labradorica;* for this "type" has elliptic-oblanceolate leaves acutish at both ends! Rydberg cites several other specimens (in the Herbarium of the Geological Survey of Canada) and presumably one or more of them agrees with his description of *S. labradorica* and Pursh's description of *S. cordifolia* in having broadly ovate cordate leaves; but if the plant designated as the "type" is to be accepted as standing for *S. labradorica,* then the description is of no account! It is surmised that the "type" was selected without consulting the description further than to pick out the first-cited specimen, which happened to be the one from Turner's Head; and the word "type" was written on the sheet, apparently by Dr. Britton, long after Rydberg had described his species.[1]

Pursh's type specimen is unknown but, as already stated, his description is well matched by actual specimens from Labrador and Newfoundland; and the figure of an oval cordate-based leaf published by Forbes, with a literal translation of Pursh's description is well matched by leaves on Fernald & Wiegand's no. 3219 or on Fernald & Long's no. 27,978. The crenulation of the margin suggested in Forbes's figure is seen on the leaves of the leading shoots of both the

[1] This case raises the question whether the description and the cited plant most nearly matching it are to be taken as of most importance, which seems the logical course; or whether the first-cited specimen, though disagreeing with the description, must be selected in lieu of a definitely cited type.

above numbers. Schneider, almost unfamiliar with true *S. cordifolia* and influenced by the specimen with elliptic or oblong leaves narrowed at base in the Hooker herbarium, was perplexed by Forbes's figure of *S. cordifolia* and was "unable to ascertain its identity."[1]

The commonest variety of *S. cordifolia* is the shrub with the leaves of the fertile branches most commonly elliptic or oblong, but varying to oblanceolate or to narrowly obovate, and narrowed or only slightly rounded at base, acute to obtuse at apex. It was a specimen of this common shrub, also cultivated in the Anderson garden, which led Hooker to remark of *S. cordifolia* Pursh: "The plant thus named for me by Mr. Borrer, who is probably acquainted with the original plant cultivated by Mr. Anderson, little deserves the appellation of *cordifolia*, its leaves being more frequently acute than retuse at the base."[2] But in view of Pursh's description and of the actual occurrence of a shrub with cordate-based ovate leaves the later specimen in Hooker's herbarium (of which a tracing is before me) cannot be taken as in any way typical of true *S. cordifolia*. This narrower-leaved shrub was well described and illustrated as *S. callicarpaea* Trautv. It should be called

S. CORDIFOLIA, var. **callicarpaea** (Trautv.), n. comb. *S. callicarpaea* Trautv. Nouv. Mém. Soc. Imp. Nat. Mosc. ii. 295, t. 7 (1832). *S. cordifolia* Trautv. l. c. 298, t. 9 (1832); Hook. Fl. Bor.-Am. ii. 152 (1839), in part; Schneider, l. c. (1918) for the most part. *S. planifolia* Hook. l. c. 150 (1839) as to Brenton plant. *S. glauca* Rydb. Bull. N. Y. Bot. Gard. i. 271 (1899) as to Labrador plant. *S. Waghornei* Rydb. l. c. (1899) in part. *S. atra* Rydb. l. c. 272 (1899).—Depressed or ascending, up to 1.7 m. high; branchlets silky-villous: leaves of the fruiting branches elliptic or oblong, varying to oblanceolate or narrowly obovate, acute to obtuse at base and apex, 2.5–6 cm. long, 1–3.5 cm. broad, silky-villous when young, becoming glabrate or nearly so in age or with merely a slight silkiness on the veins beneath. The typical form of the variety (*S. callicarpaea* Trautv.) has elliptic to narrowly ovate acute leaves. *S. cordifolia*, forma *atra* (Rydb.) Schneider, Bot. Gaz. lxvi. 346 (1918) is the form with narrowly oblong to oblanceolate leaves very acute at both ends The form with obovate obtuse leaves may prove to be *S. obovata* Pursh, l. c. (1814), Forbes l. c. 278, fig. 144 (1829). The individuals which display any serrulate-denticulate margins (frequent on vigorous shoots) have been designated *S. cordifolia*, forma *hypoprionata* Schneider, l. c. (1918). None of these forms seem worth maintaining. Var. *callicarpaea* is common from northern Labrador

[1] Schneider, Bot. Gaz. lxvi. 343 (1918).
[2] Hook. Fl. Bor.-Am. ii. 152 (1839).

to northwestern Newfoundland and the Shickshock Mts., Quebec. The following belong here. LABRADOR: 20 miles north of Nakvak, *H. S. Forbes*, no. 95; Flint Island, near Port Manvers, *O. Bryant*, no. 94; 15 miles west of Nain, *H. S. Forbes*, no. 96; Indian Harbor, *Bryant*, nos. 97, 98; Gready Island, *Bryant*, nos. 90, 92, 93; Battle Harbor, *Waghorne*, no. 21 (cited by Rydberg as *S. labradorica*); Chateau Bay, *Bowdoin College Exped.* no. 78; Red Bay, *Bowdoin College Exped.*, no. 291, *Sornborger*, no. 7; Forteau, *Fernald & Wiegand*, nos. 3209, 3211, 3212, 3220, *Long*, no. 28,029; Blanc Sablon, *Fernald & Wiegand*, nos. 3223, 3225, 3226 (type of *S. cordifolia* forma *hypoprionata* Schneider), *Griscom*, no. 1. NEWFOUNDLAND: Quirpon Island, *Fernald & Long*, nos. 27,974, 28,002; Sacred Island, *Fernald & Long*, no. 28,003; Four-Mile Cove, *Fernald, Wiegand & Long*, no. 27,969; Big Brook, *Fernald & Long*, nos. 27,966, 27,996; Flower Cove, *Fernald, Long & Dunbar*, no. 26,569, *Fernald, Griscom & Gilbert*, no. 27,981; Bear Cove, *Wiegand & Pease*, no. 27,999; St. Barbe, *Fernald, Long & Dunbar*, no. 26,574; Brig Bay, *Fernald, Long & Dunbar*, no. 26,573; Bard Harbor, *Fernald & Long*, no. 28,000; Bard Harbor Hill, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,970; St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,001; Pointe Riche, *Fernald & Wiegand*, nos. 3202, 3205; Ingornachoix Bay, *Fernald & Wiegand*, nos. 3206, 3208, 3215–3217, 3222; Cape St. George, *Mackenzie & Griscom*, no. 11,043. QUEBEC: Brest, *St. John*, no. 90,845; Caribou Island, *Martin*, no. 4 (cited by Rydberg as *S. glauca*); Archipel Ouapitagone, *St. John*, no. 90,842; Archipel de Mingan, *St. John*, nos. 90,835–90,840, 90,846, *Victorin & Rolland*, nos. 18,910, 18,911, 18,913, 18,916, 18,922–18,927, 18,929–18,931; Baie Sainte-Claire, Anticosti, *Victorin*, nos. 4349–4351; Table-top Mountains, *Fernald & Collins*, nos. 212, 521; Mt. Albert, *Fernald & Collins*, no. 63; Mt. Pembroke, *Griscom & Pease*, no. 25,680a, *Fernald & Smith*, no. 25,685; Pease Basin, between Mts. Logan and Pembroke, *Fernald, Griscom & Mackenzie*, nos. 25,673, 25,674, *Pease & Smith*, nos. 25,677–25,680; pass between Mts. Logan and Fortin, *Fernald & Pease*, no. 25,008.

Var. **intonsa**, n. var., frutex depressus vel erectus ad 1.7 m. altus; ramulis villosis; foliis maturis lanceolatis vel oblanceolatis vel ellipticis vel anguste ovatis basi apiceque acutis vel obtusis dense villosis 2–4.5 cm. longis.—LABRADOR: 20 miles north of Nakvak, August 28, 1908, *H. S. Forbes*, no. 100; Makkovik, August, 1896, *A. Stecker*, no. 3; Turner's Head, Hamilton Inlet, August 6, 1892, *Waghorne*, no. 36 (the first-cited specimen of *S. labradorica* Rydb. and selected by Dr. Britton as the "type", although in its very narrow leaves acute at base contradicting Rydberg's description,—see discussion under var. *typica*); wet moss along spring-brooks on calcareous sandstone escarpment, Blanc Sablon, September 4, 1925, *Fernald & Long*, no. 28,031. NEWFOUNDLAND: spruce thickets at base of Yankee Point, July 12, 1925, *Fernald & Griscom*, no. 28,025; rocky meadows and

brook-bottoms, upper Deer Pond Brook, Highlands of St. John, August 20, 1925, *Fernald & Long*, no. 28,030 (TYPE in Gray Herb.). QUEBEC: dry granite rock-slides at 950–1200 m. altitude, southern slope of Mt. McNab, Tabletop Mts., August 1, 1923, *Fernald, Dodge & Smith*, no. 25,681.

As already noted, the Turner's Head specimen which Britton has designated as the "type" of *Salix labradorica* Rydb. belongs with *S. cordifolia*, var. *intonsa*. In its pubescence alone does it match Rydberg's description and since both his key and his description emphasize the *broadly ovate* leaves of *S. labradorica*, it seems wholly unsafe to take up for a variety of *S. cordifolia* the misbegotten name *S. labradorica*. Similarly, I am quite unable to separate *S. cordifolia*, var. *intonsa* from some specimens from Greenland which Schneider places in his species, *S. anamesa*. But one has only to read the original discussion of *S. anamesa* Schneider, Bot. Gaz. lxvi. 348 (1918) to see that it is scarcely separable from *S. cordifolia* "from which it chiefly differs by the presence of stomata in the upper leaf surface." Schneider looks upon *S. Waghornei* Rydb. as a hybrid of *S. cordifolia* and *S. anglorum*, because it resembles the former but has stomata in the upper surface of the leaves (as in *S. anglorum*). This interpretation may be correct but not all shrubs of *S. cordifolia* with villous leaves and stomata in the upper leaf-surface can be regarded as hybrids of *S. anglorum*. For instance, *Fernald & Long's* no. 28,031 from Blanc Sablon, Labrador has such stomata, yet Schneider correctly states that the southern limit of *S. anglorum* in Labrador is in latitude 55°—fully 250 miles north of Blanc Sablon. That the presence of stomata is a *specific* character separating the Greenland shrub from the American, I am quite unwillung to admit; and Schneider's memoranda on the Greenland sheets in the Gray Herbarium are specially significant: "cf. S. anamesa Schn."; "S. anglorum Cham. f. satis sericeo-pilosa vel S. anamesae forma"; "f. incerta, prob. ad S. anamesam referenda"; "ab S. anglorum typica certe distinguere non possum (an S. anamesam accedens)"; "S. anamesa Schn. videtur"; "f. mihi incerta, prob. ad S. anamesam Schn. referenda"; "S. anamesa m."; "forma incerta. S. cordifolia v. atra vel S. anamesa Schn. videtur." Until its own author can recognize *S. anamesa* its claims to specific rank are not likely to appeal to others.

Var. MACOUNII (Rydb.) Schneider, Bot. Gaz. lxvi. 347 (1918). *S. Macounii* Rydb. Bull. N. Y. Bot. Gard. i. 269 (1899). *S. Rydbergii* Heller, Cat. N. Am. Pl. ed. 2: 4 (1900). S. *vacciniformis* Rydb.

in Britt. Man. Fl. N. St. and Can. 319 (1901).—Depressed or low shrub: branchlets villous: mature leaves elliptic, oblong or narrowly obovate, acute or acutish, mostly 1–2.5 cm. long, 0.5–1.5 cm. broad, villous or glabrate.—The following are characteristic. LABRADOR: Hopedale, *Sornborger*, no. 1. NEWFOUNDLAND: Quirpon Harbor, *Huntsman;* Schooner (or Brandy) Island, Pistolet Bay, *Pease & Long*, no. 27,997; Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 27,987, 27,988; Boat Harbor, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 27,998; Big Brook, Straits of Belle Isle, *Pease & Griscom*, no. 27,985; *Wiegand, Gilbert & Hotchkiss*, nos. 27,994, 27,995; Sandy (or Poverty) Cove, *Fernald, Long & Dunbar*, no. 26,575; Savage Cove, *Fernald & Griscom*, no. 27,992; Yankee Point, *Wiegand & Hotchkiss*, no. 27,984; Flower Cove, *Mary E. Priest*, no. C1, *Fernald, Long & Dunbar*, no. 26,571, *Fernald, Griscom & Gilbert*, no. 27,980; Ice Point, *Wiegand, Gilbert & Hotchkiss*, no. 27,993; Brig Bay, *Fernald, Long & Dunbar*, nos. 26,572, 26,578; Ingornachoix Bay, *Fernald & Wiegand*, nos. 3203, 3207, 3218, 3221; Bonne Bay, *Fernald & Wiegand*, nos. 3229, 3230, *Kimball*, nos. 136, 137; Baccalieu Island, Notre Dame Bay, *Sornborger*. QUEBEC: Caribou Island, *Martin*, no. 2; Ile à la Vache Marine, Mingan, *Victorin & Germain*, nos. 18,915, 18,932; Ellis Bay, Anticosti, *John Macoun*, no. 18,830 (TYPE); Fernald Pass, between Mts. Mattaouisse and Fortin, *Fernald, Griscom, Mackenzie, Pease & Smith*, no. 25,670; Pease Basin, between Mts. Logan and Pembroke, *Fernald, Griscom & Mackenzie*, nos. 25,671, 25,672, 25,675.

Var. **eucycla**, n. var., var. *Macounii* similis, foliis orbicularibus vel breviter oblongis apice rotundatis 0.7–2 mm. latis.—NEWFOUNDLAND: turfy limestone barrens, Capstan Point, Flower Cove, July 27, 1924, *Fernald, Long & Dunbar*, no. 26,570; limy barrens southeast and south of Flower Cove, July 10, 1925, *Wiegand, Pease, Long & Hotchkiss*, nos. 27,982, 27,991; limestone barrens near sea-level, Pointe Riche, August 4, 1910, *Fernald & Wiegand*, no. 3204 (TYPE in Gray Herb.). QUEBEC: sprawling on ledge, Ile Metchiatik, Archipel Ouapitagone, July 15, 1915, *St. John*, no. 90,841.

Var. **tonsa**, n. var., frutex depressus vel erectus ad 1 m. altus; ramulis glabris lucidis gracilibus; foliis obovatis 2.5–9 cm. longis 2–5 cm. latis glabris submembranaceis.—LABRADOR: wet land, Red Bay, August 7, 1894, *Waghorne*, no. 33 (Arnold Aboretum); springy banks and damp places, Forteau, July 30, 1910, *Fernald & Wiegand*, nos. 3213, 3214. NEWFOUNDLAND: rich thickets on lower slopes of Ha-Ha Mountain, July 17, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, nos. 27,967, 27,968; shelves, crests and talus of diorite cliffs, Ha-Ha Mountain, August 5, 1925, *Fernald & Long*, nos. 27,971 (TYPE in Gray Herb.), 27,972; wet slaty cliffs, John Kanes's Ladder, western face of Doctor Hill, August 24, 1925, *Fernald & Long*, no. 27,979. QUEBEC: schistose talus and wet shelves at base (alt. 400–600 m.) of Big Chimney, Mt. Mattaouisse, July 10, 1923, *Dodge, Griscom & Pease*, no. 25,659.

The Waghorne number from Red Bay was cited by Rydberg under *S. Waghornei* Rydb. Bull. N. Y. Bot. Gard. i. 271 (1899), but it is quite different from the type, a poor fragment, scarcely identifiable, collected by Dr. Bryant in 1860. Rydberg's description calls for a shrub with the leaves "somewhat hairy when young, but the long white hairs . . . appressed and parallel to the midrib" and the type-specimen is too near *S. cordifolia* var. *callicarpaea.*

Salix **pedunculata**, n. sp., frutex 0.5–1.5 m. altus erectus; ramulis novellis glabris fuscis deinde castaneis nitidulis; gemmis bene evolutis nondum visis; foliis immaturis membranaceis glabris ellipticis oblongis vel anguste obovatis 2–5.5 cm. longis 1–3 cm. latis subacuminatis vel plus minusve acutis, basi angustatis petiolatis petiolis 3–8 mm. longis margine subintegris vel undulato-crenatis supra viridibus sublucidisque subtus glaucis; stipulis lanceolatis 2–3 mm. longis glanduloso-dentatis deciduis; amentis foemineis coetaneis pedunculatis sub anthesi nondum visis adultioribus 4–8 cm. longis 1.1–1.4 cm. crassis densifloris; pedunculis 1–2.5 cm. longis foliis 2–3 caducis munitis pedunculo rhachique griseo-pilosis; bracteis anguste ovato-oblongis subacutis nigrescentibus 3.5–4.5 mm. longis longe pilosis; capsulis lanceolato-ovoideis longe rostratis 6–8 mm. longis breviter griseo-pilosis pilis nitidulis; stylis distinctis 1.2–1.5 mm. longis supra subclavatis stigmatibus oblongis bifidis adscendentibus stylo duplo brevioribus basi vix distinctis; pedicellis 1.5–2 mm. longis glandulam elongatam duplo superantibus.—Newfoundland: brooksides and pond-margins one mile back of Savage Cove, Straits of Belle Isle, July 14, 1925, *Fernald & Long*, no. 28,035. See p. 95.

In some characters *Salix pedunculata* suggests *S. discolor* Muhl., *S. planifolia* Pursh and *S. arctophila* Cockerell. As an erect coarse shrub with subentire to undulate glabrous leaves glaucous beneath it suggests the two former and its very long fruiting aments are suggestive of those of *S. discolor.* It is at once distinguished from both *S. discolor* and *S. planifolia* by its late flowering, the aments terminating definite and elongate leafy-bracted peduncles. The bracts (or scales) of the aments are more elongate and acute than in *S. discolor*, the style longer, and the stigmas shorter than in that species, and the capsules are shorter than in well-developed *S. discolor.* Besides by its long-peduncled instead of sessile aments *S. pedunculata* differs from *S. planifolia* in its very long fruiting aments, the longest mature aments of *S. planifolia* rarely exceeding 4 cm.; its longer pedicels and capsules and the much shorter pubescence of the latter.

In its large peduncled fruiting aments, its black scales and its

glabrous foliage, herbarium-specimens of *S. pedunculata* superficially suggest *S. arctophila*, but the latter species belongs in a very different section, with prostrate and repent habit, sessile or only short-pediceled capsules, short round-tipped bracts, etc.

The only other near relatives of *S. pedunculata* besides *S. discolor* and *S. planifolia* are *S. phylicifolia* L. of Europe, with which *S. planifolia* was formerly confused, and *S. pennata* Ball, of Washington and Oregon. From the former it is distinguished by its long peduncles and much larger fruiting aments, its longer bracts (or scales) its less deeply cleft stigmas and its longer style; from the latter, as described and illustrated by Ball, by its peduncled aments much longer in fruit, long pedicels and griseous instead of white pubescence of the capsule.

At the type-station *S. pedunculata* formed an extensive thicket at the border of a pond in the limestone barrens back of Savage Cove. It was observed only at this station but further exploration of the little known barrens along the Straits of Belle Isle will doubtless show that it, like most other species endemic in the region, extends over a considerable area.

Salix **amoena**, n. sp., frutex 1–2 m. altus erectus; ramulis novellis glabris vel sparse pilosis glabratisque deinde castaneis nitidulis; foliis immaturis membranaceis glabris ellipticis vel anguste obovatis 4–7 cm. longis 1.3–3 cm. latis apice subacutis vel obtusis basi angustatis petiolatis, petiolis gracilibus ad 1.5 cm. longis, margine undulatis vel remote adpresso-crenatis supra viridibus subtus glaucescentibus; amentis foemineis coetaneis pedunculatis 3–7 cm. longis 1.2–1.7 cm. crassis densifloris vel basi laxifloris; pedunculis 1–3.5 cm. longis foliis 3–4 munitis pedunculo rhachique sericeo-pilosis; bracteis oblongis flavidis 2–3 mm. longis longe pilosis; capsulis lanceolato-subulatis longe rostratis 6–8 mm. longis breviter griseo-pilosis pilis nitidulis; stylis distinctis 1 mm. longis stigmatibus oblongis bifidis subadscendentibus stylo brevioribus; pedicellis 1–1.5 mm. longis glandulam elongatam paulo superantibus.—Newfoundland: rich thickets on lower slopes of Ha-Ha Mountain, Ha-Ha Bay, July 17, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 38,036 (type in Gray Herb.).

In habit *Salix amoena* is very similar to *S. pedunculata* (described in this paper) but it is at once distinguished by the shorter yellow bracts of the aments, the more slender capsule, shorter style, shorter pedicels and relatively longer glands. It also simulates *S. Bebbiana*, var. *perrostrata* (Rydb.) Schneider but is quickly distinguished by the short pedicels and definite slender styles. From all forms of the protean *S. cordifolia* Pursh it stands out by its long and in maturity

flexuous or drooping aments, its distinctly undulate or crenate leaves (as in *S. discolor* and *S. Bebbiana*) and its slender pedicels.

In a springy meadow at the northern base of Ha-Ha Mountain it formed a thicket of considerable extent but staminate shrubs, if they there occur, were too far advanced for us to secure good male aments.

S. MYRTILLIFOLIA Anderss. Cold mossy brooksides and pond-margins one mile back of Savage Cove, *Fernald & Long*, no. 28,004; swale by Mile Brook, west of Big Brook, *Long & Gilbert*, no. 28,005; the only Newfoundland records from north of Ingornachoix Bay. See p. 95.

S. MYRTILLIFOLIA var. BRACHYPODA Fernald. Mossy brooksides and damp turfy slopes, Sacred Island, *Fernald & Long*, no. 28,006; meadow below limestone escarpment, western face of Bard Harbor Hill and dryish limestone talus, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, nos. 28,006, 28,010; the first stations except on Table Mt., Port-à-Port Bay. See p. 122. This may prove to be the problematical *S. latiuscula* Anderss. See p. 126.

S. CALCICOLA Fern. & Wieg. Dominant on wet or dry limestone barrens from Pistolet Bay to Ingornachoix Bay. See p. 62. Very variable, the mature foliage varying from elliptic-lanceolate to sub-orbicular and from 0.8–5.6 cm. long.

S. CRYPTODONTA Fern. Cold brooksides and pond-margins one mile back of Savage Cove, *Fernald & Long*, no. 28,026; cold springy glade, interior of southern half of Burnt Cape, *Fernald & Long*, no. 28,028; the first stations except the original, on the East Branch of the Humber. See pp. 95, 119.

S. BEBBIANA Sargent, var. PERROSTRATA (Rydb.) Schneider. Thickets, brooksides and damp calcareous slopes along the Straits, local: Big Brook, *Fernald, Wiegand & Hotchkiss*, no. 28,032; Eddies Cove Brook, *Griscom*, no. 28,038; Savage Cove, *Fernald & Long*, no. 28,033; the Rocky Mt. extreme, new to Newfoundland. See p. 95.

S. PLANIFOLIA Pursh. Schneider[1] excludes this species from the flora of Newfoundland. It abounds in northwestern Newfoundland from Quirpon to St. John Bay.

S. PELLITA Anderss. Brookside below John Kanes's Ladder, western face of Doctor Hill and meadow below calcareous sandstone escarpments, western face of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, nos. 28,057, 28,058; the only Newfoundland records from north of the Humber.

BETULA PUMILA L., var. **renifolia**, n. var., frutex depressus; ramulis villosis; foliis ramulorum fructiferorum plerumque reniformibus vel oblatis basi cordatis margine grosse dentatis.— QUEBEC: gneiss

[1] Journ. Arn. Arb. iii. 89 (1921).

ledges, Mutton Bay, Saguenay County, September 7, 1925, *Fernald & Long*, no. 28,089 (TYPE in Gray Herb.); Bonne Espérance, August 27, 1882, *J. A. Allen*, no. 70 (in part).

In typical *Betula pumila*, which abounds in Newfoundland, southern Labrador and much of eastern Canada, the principal leaves of the fertile branches are obovate and narrowed to the base. At Mutton Bay, var. *renifolia* was a dominant shrub, covering the ledges over a considerable area. No typical *B. pumila* was observed there, although our visit was brief—during the short stop of the steamer.

URTICA GRACILIS AND SOME RELATED NORTH AMERICAN SPECIES.—There are three indigenous Nettles in the region from New England to Newfoundland and Labrador. One of them has regularly passed as *Urtica gracilis* Ait., another as *U. Lyallii* Wats., and the third has been doubtfully referred sometimes to one, sometimes to the other of those species. In attempting to clear the identity of the third plant it has become obvious that we have always misidentified *U. gracilis* and that the wide-ranging boreal species (extending from Newfoundland to British Columbia, south to northern and western New England, northern New York, New Mexico and Oregon) which we have called *U. Lyallii* is not satisfactorily identifiable with the Lyall plant which Watson had before him. And not merely the type of *U. Lyallii* Wats. has been misunderstood, but the identity of his other species, *U. Breweri* of California, has been wholly misinterpreted. There are few good diagnostic characters to be found in the flowers and fruits of our perennial nettles, all of which were treated by Weddell[1] as varieties of the Old World *U. dioica* L. *U. dioica* is, as its name implies, dioecious; the native American plants strongly tend to be monoecious. In the latter series wholly pistillate individuals frequently occur but in the whole range of native American plants studied I have found no specimens which have only staminate inflorescences; various mixtures occur but all American plants apparently have some of the terminal racemes pistillate. On this account and since the American plants have clearly defined and wholly characteristic and consistent ranges, I am treating them as species, although it is not possible to assign them diagnostic fruit-characters. A large proportion of specimens are so poorly collected (for obvious reasons) that the best diagnostic character, the mature stipule, is

[1] Weddell, Mon. Urt. 78 (1856) and in DC. Prodr. xvi.[1] 50–53 (1869).

not well displayed. The texture and shape of the mature stipules, a character already used by Rydberg in his *Flora of the Rocky Mountains*, is probably as important a character as any. In the eastern and transcontinental plants the stipules are scarious to herbaceous in texture and green to at most pale-brown; in the three species confined to the Pacific slope, *U. holosericea* Nutt., *U. Breweri* Wats. (? *U. californica* Greene) and *U. Lyallii* Wats., they are subcoriaceous to coriaceous and soon become deep-brown to castaneous. As a result of the present study the following memoranda on the principal perennial species of temperate North America are recorded.

Urtica gracilis Ait. Hort. Kew. iii. 341 (1789). As usually interpreted, *U. gracilis* is the tall species of the eastern United States with the stems only slightly, if at all bristly, except at base, but cinereous-pilose above; the primary leaves ordinarily oblong-lanceolate or narrowly ovate-lanceolate, with 20–35 teeth on each margin—those subtending the lowest inflorescences with 19–38 (av. 25); the petiole $\frac{1}{5}$–$\frac{3}{5}$ as long as the blade; the lower leaf-surfaces ashy-puberulent and the stipules densely cinereous-puberulent. This plant is of wide range in the United States, westward across the Mississippi Basin; and, so far as shown in the Gray Herbarium, its northeastern limit extends from the warm southern side of the Gulf of St. Lawrence (Nova Scotia and Prince Edward Island—lat. 46°–47°) across southern Aroostook County, Maine (lat. 46° 40′) to the region slightly north of Montreal (lat. 46° 20′) and the counties of Ontario bordering Lake Ontario (lat. 44°).

When Aiton's original description is studied some points are apparent which at once indicate that we have been in error in applying to the plant just defined the name *U. gracilis*. Aiton's description was brief but clear:

"6. U. foliis oppositis ovato-lanceolatis nudiusculis, caule petiolisque hispidis, racemis geminis.
Slender-stalk'd Nettle.
Nat. of Hudson's Bay.
Introd. 1782, by the Hudson's Bay Company."

The description alone might be given little weight, were it not for the type region, Hudson Bay, hundreds of miles to the north of the known northern limit of the tall species with puberulent closely toothed leaves and cinereous stipules. But in view of the occurrence in northwestern Newfoundland and on the Labrador Peninsula, thence westward to British Columbia, and south to the Magdalen

Islands, northern and western New England, northern New York, New Mexico and Oregon, of a plant with ovate-lanceolate usually glabrous slender-petioled leaves with the upper half of the stem and the petioles often bristly, it seems clear that it is this more northern species which should bear the name *U. gracilis*. The more boreal plant has the stems glabrous or merely setulose above; the leaves lanceolate to ovate, glabrous or only sparingly pilose beneath; their margins more coarsely toothed than in the more southern species—each side of the leaves subtending the lowest inflorescences having 13–23 (av. 17) teeth; the petiole slender and elongate, 1.5–5.5 (av. 3) cm. long, $\frac{1}{5}$–$\frac{3}{5}$ as long as the blade; and the very thin stipules often nearly glabrous. This is the plant which in eastern America has passed as *U. Lyallii* Wats., but the Lyall plant, as already noted, is a species of the north Pacific slope with firm and finally castaneous stipules.

With *U. gracilis* now identified as the northern transcontinental long-petioled species, the "Slender-stalk'd Nettle" of Aiton which has erroneously passed as *U. Lyallii*, it is necessary to find the correct name for the more southern plant with cinereous puberulence which has passed as *U. gracilis*. This seems to be, without question, *U. procera* Muhl. in Willd. Sp. Pl. iv.[1] 353 (1805).

The third indigenous species of northeastern America is with us a plant of the coast, chiefly at the upper borders of beaches, occurring from southeastern Labrador to Maine but reappearing in the Rocky Mountains, from Alberta to New Mexico. It is a lower but coarser plant than either *Urtica gracilis* or *U. procera*, its leaves with glabrous to pilose-hirsute lower surfaces, coarse teeth and short, stout petioles; the leaves subtending the lowest inflorescences having 11–25 (av. 17) pairs of teeth and petioles 0.7–2.5 (av. 1.3) cm. long, only $\frac{1}{8}$–$\frac{1}{4}$ as long as the leaf-blade. Its staminate inflorescences are short and thick and its stipules comparatively long. This short-petioled species was described from the Rocky Mountains as *U. viridis* Rydb. Bull. Torr. Bot. Cl. xxxix. 305 (1912).

Since these three species have all passed as *Urtica gracilis* it is well to reenumerate their diagnostic characters and to cite some characteristic specimens.

U. GRACILIS Ait. Hort. Kew. iii. 341 (1789). *U. cardiophylla* Rydb. Bull. Torr. Bot. Cl. xxiv. 191 (1897). *U. Lyallii* of eastern Am. authors, not Wats.—Slender, 0.3–1 m. high: stem glabrous above or somewhat setulose and sparingly pilose: leaves lanceolate

to ovate, rounded to cordate at base, slender-petioled, glabrous on both surfaces or sparingly pilose beneath, coarsely serrate; those subtending the lowest inflorescences 5–15 (av. 9) cm. long, with 13–23 (av. 17) pairs of teeth and with petioles 1.5–5.5 (av. 3) cm. long and $\frac{1}{5}$–$\frac{3}{5}$ as long as the blade: stipules thin, greenish to straminеous, glabrous to pilose, much shorter than the petioles: inflorescences slender, usually forking, mostly moniliform or interrupted.—Northwestern Newfoundland to northern Maine, western New England and northern New York; Alberta and British Columbia, south to New Mexico and Oregon. The following are characteristic. Newfoundland: rich thickets and glades near timber-line, Bard Harbor Hill, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,099; springy cliffs and talus above the Overfall of Deer Pond Brook, Highlands of St. John, *Wiegand, Gilbert & Hotchkiss*, no. 28,103; bushy swale on flat north of Doctor Hill, St. John Bay, *Fernald & Wiegand*, no. 28,104. Quebec: Seven Islands, Saguenay Co., *C. B. Robinson*, no. 946; thicket, Dartmouth River, Gaspé Co., *Collins, Fernald & Pease*, no. 5503; limestone detritus in thickets, Les Murailles, Percé, *Fernald & Collins*, no. 1003; calcareous sea-cliffs and rock-slides by the Gulf of St. Lawrence, slightly west of Marten River, Gaspé Co., *Fernald & Pease*, no. 25,029; thickets and wet rock-talus, Nettle Gully, alt. about 400 m., northern base of Mt. Collins, *Fernald & Pease*, no. 25,038 (locality given on label as "Mt. Logan"), *Fernald & Smith*, no. 25,712; Tadousac, August 9, 1892, *G. G. Kennedy*. Magdalen Islands: cool wooded bank, Grindstone Island, *Fernald, Long & St. John*, no. 7321; open spruce woods, Basin Island, *Fernald, Bartram, Long & St. John*, no. 7319; sandy bank, Amherst Island, *St. John*, no. 1850. Prince Edward Island: by brook in woods, Harmony, *Fernald & St. John*, no. 11,033. Maine: Fort Kent, 1881, *Kate Furbish;* alluvial island, Seven Islands, St. John River, *St. John*, no. 2278. Vermont: Burlington, August 16, 1901, *L. R. Jones* (probably introduced); Wallingford, May 25, 1908, *E. F. Williams* (probably introduced). Connecticut: roadside, Stafford, August 27, 1903, *Bissell, Graves* (probably introduced). New York: roadsides, Potsdam, *Phelps*, no. 385 (probably introduced). Montana: banks of Missouri River, alt. 3600 ft., *Scribner*, no. 251; Bald Mountain, alt. 7000 ft., *Watson*, no. 357 (distributed as *U. Breweri*). Wyoming: Centennial Valley, *A. Nelson*, nos. 1273, 1862 (as *U. Breweri*). Colorado: Bob Creek, western La Plata Mts., *Baker, Earle & Tracy*, no. 282; near Pagosa Peak, alt. 9000 ft., *Baker*, no. 281; North Elk Canyon, Rio Blanco Co., July 26, 1902, *Sturgis*. New Mexico: bottom of Moro River, *Fendler*, no. 821; White Mts., alt. 7000 ft., *Wooton*, no. 305; Windsor Creek, alt. 8400 ft., Pecos River National Park, *Standley*, no. 4259. Idaho: river-bank, St. Anthony, *Merrill & Wilcox*, no. 853. Oregon: mountain streams and bogs, alt. 4000–6000 ft., *Cusick*, no. 2070. Washington: Columbia River, Klikitat Co., *Suksdorf*, no. 58; near

Ellensburgh, *Brandegee*, no. 1075; low meadows, Pullman, July 10, 1895, *Hardwick, Piper;* along streams in woods, Blue Mts., July 17, 1896, *Piper;* near streams, Waitsburg, *Horner,* no. B443; Montesano, *Heller*, no. 3920; among bushes along streams, Mt. Paddo, *Suksdorf*, no. 6354. BRITISH COLUMBIA: Upper Alloknejik Lake, July, 1882, *McKay;* thickets, Beaver Creek, Selkirk Range, July 13, 1885, *Macoun;* deep thicket at Nelson, *Shaw*, no. 667; thickets, Yoho Valley, July 28, 1916, *Hunnewell.*

U. PROCERA Muhl. in Willd. Sp. Pl. iv. 353 (1805). *U. gracilis* of most Am. auth., not Ait. *U. dioica*, t. *procera* (Muhl.) Weddell, Mon. Urt. 78 (1856). *U. longifolia* Raf. acc. to Weddell, l. c. (1856). —Slender and tall, up to 1 m. or more high: stem only slightly if at all bristly but cinereous-pilose or -puberulent toward the summit: leaves oblong-lanceolate to narrowly ovate-lanceolate, usually cinereous-puberulent beneath, slender-petioled, rather closely serrate; those subtending the lowest inflorescences 6.5–18 (av. 11) cm. long, with 19–38 (av. 25) pairs of teeth and with petioles 1.5–8.5 (av. 4.5) cm. long and $\frac{1}{5}$–$\frac{3}{5}$ as long as the blade: stipules submembranaceous, cinereous-puberulent, much shorter than the petioles.—Nova Scotia and southern Quebec to North Dakota, south to North Carolina and Louisiana. The following are characteristic. QUEBEC: roadside, Lac Mercier to Lac Tremblant, Terrebonne Co., July 29, 1922, *Churchill;* très abondant sur la terre noire de St. Hubert, *Victorin,* no. 17,441; dry pasture, Philipsburg, August, 1923, *Knowlton.* PRINCE EDWARD ISLAND: swampy woods and thickets along Brackley Point Road, *Fernald, Long & St. John*, no. 7320. NOVA SCOTIA: open woods about bases of gypsum cliffs, Port Bevis, *Fernald & Long*, no. 21,037; damp thickets near Tusket River, Tusket Falls, *Fernald, Bissell, Graves, Long & Linder,* no. 21,036; rocky roadside, Belleville, *Fernald & Long*, no. 23,786. MAINE: moist roadside, Limestone, *Cushman*, no. 2265; river-thicket, Masardis, September 8, 1897, *Fernald;* Fort Fairfield, July 19, 1902, *Williams, Collins & Fernald;* thicket, Bradley, July 17, 1890, *Fernald;* Buckfield, September, 1889, *Parlin;* moist roadside-thickets, Monhegan Island, *Jenney, Churchill & Hill,* no. 3231; river-shore, Topsham, August 29, 1912, *Kate Furbish;* roadside clearing, Baldwin, *Fernald, Long & Norton,* no. 13,511; Kittery Point, August 27, 1895, *E. F. Williams.* NEW HAMPSHIRE: wet roadside, Colebrook, *Pease,* no. 10,904; shaded street, Jefferson, *Pease*, no. 16,704; open roadside, Hillsborough, September 11, 1920, *C. F. Batchelder;* thicket, edge of rich heavy woods, Walpole, August 21, 1916, *Batchelder;* near dwellings, Jaffrey, *Robinson*, no. 297. VERMONT: Middlebury, August 7, 1883, *Brainerd;* Weybridge, July 8, 1908, *E. F. Williams;* roadside spring, Wallingford, July 23, 1907, *Kennedy;* Manchester, *Day*, no. 156. MASSACHUSETTS: brackish ground, Newburyport, *D. White*, no. 421; farm-yard, Concord, September 27, 1896, *Williams;* near outlet of Spot Pond, Middlesex Fells, August 19, 1920, *Kidder;* Needham,

August 1, 1886, *T. O. Fuller;* North Scituate, August 15, 1901, *Kennedy;* thickets along roadside, Barnstable, *Fernald & Long,* no. 16,724; open grassy roadsides, West Chesterfield, *Robinson,* no. 493; low ground, Monterey, July 7, 1920, *Hoffmann;* alluvium, Lanesboro, July 20, 1915, *Churchill.* Rhode Island: Rumford, September 6, 1903, *Williams;* Wickford, June 17, 1908, *Kennedy.* Connecticut: sandy bank, Thompson, June 10, 1922, *Bill & Grigg;* roadside, Southington, *Bissell,* no. 533; dry thicket, North Guilford, August 19, 1906, *G. H. Bartlett;* roadside waste, Newton, September 26, 1901, *Eames.* New York: western New York, *Sartwell.* Pennsylvania: shore of Delaware River, Morrisville, *Bartram,* no. 1298. Kentucky: Lexington, *Short.* Ontario: woods, Hay Island, Gananoque, July 20, 1908, *Kennedy;* Plevna, August 5, 1902, *Fowler;* Belleville, *Macoun,* no. 1584. Michigan: under scattered hardwood, Turin, Marquette Co., July 30, 1901, *Barlow;* Grand Rapids, September 29, 1860, *Wm. Boott.* Illinois: Mahomet, *Gleason,* no. 75; Bloomington, August, 1886, *Robinson.* Minnesota: Lake Kilpatrick, Cass Co., July, 1893, *Ballard.* Nebraska: Keyapaha Co., *Clements,* no. 2910; woods near Plummer Ford, Dismal River, *Rydberg,* no. 1520. North Dakota: prairies, Leeds, July 31, 1896, *Lunell;* black alluvial loam, near Fargo, August 23, 1901, *Waldron & Manns.* Kansas: bank of Joy Creek, Osborne Co., *Shear,* no. 201.

U. viridis Rydb. Bull. Torr. Bot. Cl. xxxix. 305 (1912).—Stouter than *U. gracilis,* 2–8 dm. high: stem glabrous, or pilose above: primary leaves lanceolate to narrowly ovate, firm, rounded at base, short-petioled, glabrous on both surfaces or pilose-hirsute beneath, coarsely serrate; those subtending the lowest inflorescences 3.5–10 (av. 7) cm. long, with 11–25 (av. 17) pairs of coarse teeth and with petioles 0.7–2.5 (av. 1.3) cm. long and $\frac{1}{8}$–$\frac{1}{4}$ as long as the blade: stipules lanceolate, with glabrous scarious margins, from one-half as long to longer than the petioles: inflorescences dense and thick; the staminate commonly 3–6 mm. thick.—Straits of Belle Isle, Labrador southward along the coast to Lincoln Co., Maine; Alberta to South Dakota and New Mexico. The following are characteristic. Labrador: springy banks and damp hillsides, Forteau, *Fernald & Wiegand,* no. 3279; sand-bank bordering beach, Forteau, *Long,* no. 28,101; abundant by streams on the calcareous sandstone terraces, Blanc Sablon, *Fernald & Wiegand,* no. 3280. Newfoundland: turfy barrens and slopes, Sacred Island, *Wiegand, Gilbert & Hotchkiss,* no. 28,100; rich thickets on lower slope of Ha-Ha Mountain, *Fernald, Wiegand, Long, Gilbert & Hotchkiss,* no. 28,097; limestone shingle and gravel along shore, Flower Cove, *Fernald, Long & Dunbar,* no. 26,604; damp thickets, Bear Cove, *Wiegand & Pease,* no. 28,098; turfy limestone shore, St. Barbe, *Fernald, Long & Dunbar,* no. 26,605; sandy shore back of Cow Head, *Fernald & Wiegand,* no. 3278; woods, Lark Harbor, *Waghorne,* no. 29; door-yard, near Frenchman's Cove, *Markenzie & Griscom,* no. 10,247. Quebec: rocky shore, Piashtibaie,

St. John, no. 90,396; sur le rivage calcaire, Ile Herbée, Mingan, *Victorin & Rolland*, no. 18,570; autour des habitations, Pointe-aux-Esquimaux, *Victorin & Rolland*, no. 18,497; abondant sur les rivages, Ilets de la Baie à Jean, *Victorin & Rolland*, no. 18,408; Baie Sainte-Claire, Anticosti, *Victorin*, no. 4197; sur les rivages calcaires, Baie du Renard, Anticosti, *Victorin, Rolland & Louis*, no. 22,053. MAGDALEN ISLANDS: Ile du Hâvre-au-Ber, *Victorin & Rolland*, no. 9627. NEW BRUNSWICK: clearings, Bathurst, *Blake*, no. 5434. MAINE: Machias Seal Island, July 27, 1902, *Mrs. A. H. Norton*; waste ground, Seal Harbor, August 30, 1889, *Redfield;* beach, Great Cranberry Isle, August 20, 1888, *Rand;* south and east shores of Little Cranberry Isle, August 6, 1889, *Redfield;* sandy ridge back of beach, Flye's Island, Brooklin, *Hill*, no. 586; barrier beach, Atlantic, Swans Island, *Hill*, no. 1552; old cellar-hole, Outer Heron Island, Boothbay, *Fassett*, no. 804. NORTH DAKOTA: damp canyons, Deadwood, *Carr*, no. 143. ALBERTA: Rocky Mountains, 1858, *Bourgeau* (cited by Rydberg); Red Deer River, *Macoun*, nos. 200, 1584; thickets, Red Deer Valley, vicinity of Rosedale, *Moodie*, no. 1094; MONTANA: Emigrant Gulch, *Rydberg & Bessey*, no. 3935 (TYPE no.). WYOMING: along the creek, creek bottoms, Halleck Cañon, *A. Nelson*, no. 7444 (cited by Rydberg); Merican Mines, *A. Nelson*, no. 590. COLORADO: Gunnison, *Baker*, no. 601; low wet bottoms, Mancos, *Baker, Earle & Tracy*, no. 40. NEW MEXICO: *Parry*, 1867, no. 196.

Urtica viridis is the North American counterpart of the Asiatic *U. angustifolia* Fisch. In its short-petioled narrow leaves with coarse teeth and often quite glabrous surfaces it exactly matches sheets of the latter from Siberia, Mandchuria and Afghanistan, but all the Asiatic specimens agree with the descriptions in being strictly dioecious, like the Old World *U. dioica*, while *U. viridis* is nearly always definitely monoecious. It is probable that some references to *U. angustifolia* in America belong to *U. viridis*.

As stated in the introductory paragraph Watson's species, *Urtica Lyallii* and *U. Breweri* have both been misinterpreted.

U. Lyallii Wats. Proc. Am. Acad. x. 348 (1875) was primarily "A very large leaved species collected by Dr. Lyall in the Cascade Mts. in lat. 49°" but "more densely hispid" specimens were also cited from Marin Co., California, collected by Bolander and Kellogg ("H. N. BOLANDER, KELLOCK, M. D. & CO." on the label) and a slender plant collected by Lyall on Vancouver Island was cited as "probably the same." The first-cited plant, which was collected by Lyall and which formed the chief basis of the species must be taken as type. This and the Lyall material from Vancouver Island are fortunately conspecific and represent the glabrous or but slightly

pubescent species of Alaska, British Columbia, Washington and Oregon, with slender petioles, ovate, often cordate thin leaves and firm brownish, often finally castaneous stipules. The plant from Marin County is a specimen of the much coarser and more southern *U. Breweri* Wats. (? *U. californica* Greene). *U. Breweri* Wats. l. c. (1875) was based primarily on Brewer's no. 95 from Los Angeles, but specimens collected by Bigelow in western Texas and by Wolf in southern Colorado were also cited. The Brewer plant from Los Angeles, the type of the species, is not at all like the Bigelow and Wolf specimens. The two latter are very characteristic specimens of the *annual* species, *U. gracilenta* Greene. In fact, Watson himself, after originally calling these *U. Breweri*, penciled on the sheet containing them: "Probably distinct species. Lvs. large, thin, coarsely toothed, *few-nerved*, long-petioled. Stupiles *herbaceous*, linear-lanceolate. Calyx villose." Nevertheless, on a sheet of the original material of *U. gracilenta* sent by Greene he penciled " = *U. Breweri*, Watson." The type of *U. Breweri* (Brewer's no. 95 from Los Angeles) consists of two fragments picked obviously late in the season from a large almost woody stem. There are no primary leaves, only those of secondary shoots, but their characteristic pubescence and their firm brown stipules show them to belong apparently to the very characteristic coarse species of the coast of California farther north, afterward described as *U. californica* Greene, Pittonia, i. 281 (1889). The Marin County plant included by Watson under *U. Lyallii* also belongs here (a good match for authentic *U. californica*). Dr. I. M. Johnston informs me that the uncharacteristic fragments which formed the type of *U. Breweri* have not been matched by recent collections from Los Angeles and that the Brewer material might have been collected nearer San Francisco and erroneously labeled.

The widely distributed plant which generally passes as *Urtica Breweri* is quite distinct and no material of it was included by Watson in his original account. As usually incorrectly interpreted, *U. Breweri* is identified as a tall cinereous-puberulent plant with the coarsely toothed narrow leaves velvety-puberulent beneath, and with the lanceolate puberulent stipules drab or greenish, occurring from Idaho and Washington southward through California, Arizona and New Mexico into Mexico. The plant is the western representative of *U. procera* but it seems to be a reasonably distinct species. Its correct name seems to be

U. SERRA Blume, Mus. Bot. Lugd.-Bat. ii. 140 (Nov., 1855). *U. dioica, β. angustifolia* Schlecht. Linnaea, vii. 141 (1832), not *U. angustifolia* Fisch. (1819). *U. aquatica* Liebm. K. Dansk. Vidensk. Selsk. Skrift. ser. 5, ii. 291 (1851), not Moon (1824). *U. mexicana* Blume, l. c. (1855), not Liebm. (1851). *U. dioica*, var. *occidentalis* Watson, Bot. U. S. Geol. Expl. Fortieth Par. 321 (1871).

Blume's species, *U. serra* and *U. mexicana*, and the other species (including *Lythraceae*) published at the same time are usually cited as dating from 1852. The latter date appeared on No. 1 of vol. ii. of the *Museum Botanicum*, but in Bot. Zeit. xiv. 186 (1856) Miquel showed that Nos. 1–8 of vol. ii. were not put on sale until 1856; and he later indicated (p. 540) that the four numbers, 9–12, were published respectively in November and December, 1855, and January and February, 1856.

COMANDRA RICHARDSIANA Fernald. Dominant on turfy or peaty knolls in the limestone barrens from Pistolet Bay to St. John Bay. See p. 91. Previously known in Newfoundland only from Mackenzie & Griscom's collection from the Bay of Islands.

OXYRIA DIGYNA (L.) Hill. Wet quartzite rocks and gravel along brook, Southwest Gulch, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,115, the first station in Newfoundland since La Pylaie's discovery of it on Grois Island. See p. 124.

RUMEX OCCIDENTALIS Wats. The only indigenous dock of northwestern Newfoundland, frequent in swales or on peaty or turfy shores from Pistolet Bay to St. John Bay. See pp. 54, 118.

SALICORNIA EUROPAEA L., var. PROSTRATA (Pall.) Fern. Damp depressions in sand and gravel back of barrier beach, Argentia, *Fernald, Long & Dunbar*, no. 26,644; the first in Newfoundland except from Bay St. George and Port-à-Port Bay. See p. 86.

SUAEDA RICHII Fernald. Damp depressions in sand and gravel back of barrier beach, Argentia, *Fernald, Long & Dunbar*, no. 26,645, the first fruiting material from Newfoundland. Records of young plants from Bay St. George and Notre Dame Bay probably belong here. See p. 86.

ARENARIA DAWSONENSIS Britton (*A. litorea* Fernald). Depressions of limestone barrens along the Straits, widely distributed but rather local; previously unknown from north of Bay of Islands and Notre Dame Bay. See p. 62.

A. CYLINDROCARPA Fernald. Widely distributed in clay and gravel of the limestone barrens from Pistolet Bay to Port-à-Port Bay. See p. 79.

STELLARIA FLORIDA Fischer. Springy swale and turfy upper border of strand, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, nos. 28,196, 28,197; a Kamtchatkan species collected for the first time in America in 1923 on Tabletop Mts., Gaspé. See p. 123.

Cerastium alpinum L. The typical form of the species was seen only once: mossy brooksides and damp turfy slopes, Sacred Island, *Fernald & Long*, no. 28,208, probably new to Newfoundland.

C. alpinum, var. glanduliferum Koch. Dry limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,204, new to Newfoundland.

C. alpinum, var. lanatum (Lam.) Hegetschw. Common on turfy or gravelly slopes or on cliffs from Quirpon westward to Four-Mile Cove. See pp. 54, 98.

C. Regelii Ostenf. Limestone ledges on the west side of Schooner (Brandy) Island, Pistolet Bay, *Pease & Long*, no. 28,212. See p. 106. An arctic Eurasian species heretofore known in America only from Cape Nome, Alaska (*Blaisdell*), the material of the latter collection identified by Dr. Ostenfeld.

C. cerastioides (L.) Britton. Wet mossy rocks and gravel along brook, Southwest Gulch, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,231, the only known station, except Tabletop Mts., Gaspé, south of northern Labrador. See p. 124. Only a single over-ripe specimen was noticed, snatched at the last moment after the order to quit had been given. It was on gravel at the forks of the Gulch and had presumably washed down from higher up.

C. viscosum L. Turfy roadside, Burgeo, *Fernald, Long & Dunbar*, no. 26,678, an obvious adventive, new to Newfoundland.

Ranunculus hyperboreus Rottb. Brooksides and springy calcareous meadows, Savage Cove, *Fernald, Long & Dunbar*, no. 26,686, *Fernald & Griscom*, no. 28,251; dried-out shallow pools in limestone barrens, Sandy (Poverty) Cove, *Fernald, Long & Gilbert*, no. 28,252; swaley margin of pool in limestone barrens, Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,685; shallow water of old beaver pond near the Yellow Marsh, back of Bard Harbor, St. John Bay, *Gilbert & Hotchkiss*, no. 28,253. See pp. 61, 127. New to Newfoundland, the old records having been based on either *R. Cymbalaria* Pursh or *R. hederaceus* L.

R. pedatifidus J. E. Sm., var. leiocarpus (Trautv.) Fern. (*R. affinis* R. Br.). Turfy or gravelly shelves, crests and talus of diorite cliffs, Ha-Ha Mountain, *Pease & Griscom*, no. 28,258, *Fernald & Long*, no. 28,259; mossy and turfy trap cliffs and talus, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,260; the first stations south of the Torngat region of Labrador. See pp. 104, 123, also pl. 153, fig. 3.

R. pensylvanicus L. f. Boggy meadows and clearings back of Bard Harbor, St. John Bay, very scarce, *Wiegand, Gilbert & Hotchkiss*, no. 28,266, the first authentic station except from the lower Exploits.

R. Macounii Britton. Brookside in bushy swale on flat north of Doctor Hill, St. John Bay, no. 28,267, the first from north of Hawke Harbour. See p. 127.

ANEMONE MULTIFIDA Poir. var. HUDSONIANA DC. Dry limestone cliffs and talus, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 28,278, our only station except on the lower Exploits and Notre Dame Bay. See p. 126.

BARBAREA ORTHOCERAS Ledeb. Peaty borders of spruce thickets, Savage Cove, *Fernald & Griscom*, no. 28,317; brooksides and slaty hills, Little Quirpon, *Wiegand, Gilbert & Hotchkiss*, no. 28,318, *Fernald & Gilbert*, no. 28,319, *Wiegand & Hotchkiss*, no. 28,320; our first stations outside the Exploits Valley. See p. 121.

CARDAMINE PRATENSIS L., var. ANGUSTIFOLIA Hook. Dominant in peat and damp turf on the limestone barrens from Pistolet Bay westward to Deadman Cove, the first area known south of northern Labrador. See p. 91.

LESQUERELLA ARCTICA (Wormskj.) Wats. Dry gravelly limestone barrens, Burnt Cape to Big Brook; St. John's Island; previously known from Table Mt., Port-à-Port Bay and Cape St. George. See pp. 100, 103, 118.

L. arctica, var. *Purshii* Wats., seems to have no characters of value.

DRABA NIVALIS Lilj. Gravelly shelves, crests and talus of Ha-Ha Mountain, *Pease & Griscom*, no. 28,342; crevices of trap cliffs, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,347; open peaty and gravelly spots on crests of trap cliffs, Cape Onion, *Fernald & Long*, no. 28,346; dry slaty crests of hills, Little Quirpon, *Fernald & Long*, no. 28,343; rocky crests of Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 28,344; new to Newfoundland. See pp. 104, 121, 123.

DRABA INCANA L. Typical *D. incana* with glabrous fruit is rare on the Straits: gravelly limestone shore, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 28,348.

D. INCANA, var. CONFUSA (Ehrh.) Poir. Abundant on peaty and turfy calcareous slopes and shores from Pistolet Bay to Cow Head. See pp. 60, 90.

D. MEGASPERMA Fern. & Knowlt. Peaty and gravelly limestone shores from Quirpon to Brig Bay. See pp. 53, 90.

D. ARABISANS Michx. Limestone cliffs and talus, western escarpments of Bard Harbor Hill and Doctor Hill, Highlands of St. John; only stations north of Bay of Islands. See p. 117.

D. PYCNOSPERMA Fern. & Knowlt. Dry limestone cliffs and talus, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 28,369; heretofore known only from the type region, Percé, Gaspé Co., Quebec. See. p. 125.

D. HIRTA L. Dominant on calcareous areas, northwestern Newfoundland. See p. 90.

D. RUPESTRIS R. Br. Dominant on calcareous areas, northwestern Newfoundland. See pp. 60, 90.

Arabis Drummondi Gray. Meadow below limestone escarpment, western face of Bard Harbor Hill, *Fernald & Long*, no. 28,422; only known Newfoundland station except along lower Exploits. See p. 124.

A. Drummondi, var. connexa (Greene) Fernald. Mossy and turfy trap cliffs and talus, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,421; dryish limestone talus, western face of Doctor Hill, *Fernald & Long*, no. 28,420; new to Newfoundland. See p. 123.

Braya **Longii**, n. sp., planta perennis humilis plerumque multiceps; radice crassa longe descendenti; caulibus adscendentibus saepe purpurascentibus 1–10 cm. longis rare fructiferis usque ad 15 cm. longis nudis vel sub racemo monophyllis, pilis simplicibus bifurcatisque inaequilongis griseis sparse obsitis; foliis rosulatis carnulosis linearioblanceolatis obtusis 1–4 cm. longis 1–3 mm. latis integris glabris vel basi dilatato apiceque sparse ciliatis; racemo sub anthesi dense corymboso, fructifero plus minusve elongato 1–7 cm. longo 3–20-floro, fructibus contiguis vel infimis 1–2 distantibus; pedicellis crassis 1–4.5 mm. longis fructiferis arcte adscendentibus; sepalis deciduis plerumque viridibus rare purpurascentibus glabris 2–3 mm. longis oblongis vel ellipticis apice rotundatis margine hyalinis; petalis 4–5.5 mm. longis late obovatis albis tandem basin versus violaceis; staminibus 2–3 mm. longis; antheris 0.4–0.6 mm. longis; pistillo lanceolato glabro, ovario ovulis 10–16, stylo crasso cylindrico, stigmate depresso stylo latiore bilobato; siliquis lanceolato-subulatis 4–9 mm. longis 1–2 mm. latis stylo crasso 0.4–0.8 mm. longo coronatis, valvis glabris, septo albo uninervo vel enervo; seminibus oblongo-ovatis brunneis 1.2–1.5 mm. longis 0.5–0.8 mm. latis.—Shores of the Straits of Belle Isle, northwestern Newfoundland: turfy or peaty pockets in limestone ledges, Sandy (or Poverty) Cove, August 1, 1924, *Fernald, Long & Dunbar*, no. 26,723 (distributed as *B. purpurascens*); among loose rocks, limestone barrens, Sandy Cove, July 12, 1925, *Fernald & Griscom*, no. 28,423; gravelly and peaty limestone barrens, Sandy Cove, July 25, 1925, *Fernald, Long & Gilbert*, no. 28,424 (type, in Gray Herb.); dry gravelly limestone barren, Savage Point, July 13, 1925, *Fernald, Wiegand, Pease, Long, Gilbert & Hotchkiss*, no. 28,425; dry gravelly and turfy limestone barrens, Savage Point, August 29, 1925, *Fernald & Long*, no. 28,426; crevices of limestone barrens, Yankee Point, August 16, 1925, *Fernald, Wiegand & Long*, no. 28,427.

A beautiful species, originally detected by my companion on many hard trips, Bayard Long, to whose keenness in the field we owe many of the most interesting discoveries of the recent Newfoundland trips. *B. Longii* superficially resembles *B. purpurascens* (R. Br.) Bunge of the Arctic, with which the first collection was placed. It differs, however, in its narrower basal leaves; sparser but more often forking

pubescence of the stems; longer and broader petals; glabrous (not pilose) ovary and silique, the latter lance-subulate rather than ellipsoid or oblong-ovoid; and fewer (in *B. purpurascens* 16–20) and slightly larger seeds. In having seeds fewer than in *B. purpurascens*, *B. Longii* comes closer to *B. rosea* (Turcz.) Bunge of Siberia; but that species, of which three authentic collections are before me, has broader leaves; the stems very densely pilose with long hairs; the purple sepals 1.8–2.2 mm. long and densely pilose on the back; the narrowly obovate or spatulate-oblanceolate petals becoming wholly roseate and only 2.5–3.5 mm. long; the mature fruiting raceme but slightly elongated; the mature pedicels slender and elongating sometimes to 8 mm.; and the capsule oblong-ellipsoid and at most 6 mm. long. See pp. 77, 94.

Braya **americana** (Hook.) n. comb. *B. alpina*, *β. americana* Hook. Fl. Bor.-Am. i. 65 (1830). Planta perennis plerumque multicaulis; caulibus adscendentibus 1–10 cm. longis teretibus simplicibus purpurascentibus, pilis furcatis brevibus inaequilongis griseis obsitis; foliis rosulatis carnulosis lineari-oblanceolatis 0.6–3 cm. longis 0.5–2 mm. latis integris glabris vel basi apiceque plus minusve ciliatis; racemo sub anthesi capitato-corymboso, fructifero 0.7–7 cm. longo densiuscule 3–20-floro, floribus infimis 1–3 distantibus plerumque in axillis foliorum superiorum; pedicellis 1–4 mm. longis arcte adscentibus; sepalis subpersistentibus plerumque purpurascentibus 1.5–2.5 mm. longis oblongis apice rotundatis margine hyalinis: petalis 1.5–4 mm. longis spathulato-oblanceolatis vel anguste obovatis albidis deinde roseis apice rotundatis; staminibus 1.5–3.5 mm. longis, antheris 0.3–0.5 mm. longis; pistillo lanceolato, ovario ovulis 10–16 pilis plerumque bifurcatis hirto, stylo gracili ovario valde angustiori, stigmate depresso-capitato stylo valde latiori manifeste bilobato; siliquis lanceolato-subulatis 4–7 mm. longis 1.3–2 mm. latis stylo gracili 0.5–1 mm. longo coronatis, valvis hirtellis, septo manifeste uninervo; seminibus anguste ovoideis 1–1.4 mm. longis 0.5–0.7 mm. latis brunneis.—Alberta and Newfoundland. The following have been examined. Alberta: Cataract Pass below Summit, August 4, 1908, *S. Brown*, no. 1457 (as *B. purpurascens*). Newfoundland: open soil on limestone barrens near Ice Point, St. Barbe Bay, July 14, 1925, *Wiegand, Gilbert & Hotchkiss*, no. 28,429; gravelly limestone barrens one mile back of Savage Cove, Straits of Belle Isle, July 14, 1925, *Fernald & Long*, no. 28,428, July 23, *Fernald, Pease & Long*, no. 28,438; gravelly limestone barren, Four-mile Cove, Straits of Belle Isle, July 20, 1925, *Fernald, Wiegand & Long*, no. 28,437; moist gravel of limestone barrens on the Highlands northeast of Big Brook, Straits of Belle Isle, July 15, 1925, *Pease & Griscom*, no. 28,430; gravelly and peaty limestone barrens back of Big Brook, July 15,

1925, *Fernald & Long*, no. 28,431; swale near mouth of brook, Watts Bight, Straits of Belle Isle, July 19, 1925, *Pease, Griscom, Gilbert & Hotchkiss*, no. 28,436; sandy and clayey spots in limestone gravel-barrens, Boat Harbor, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 28,435; dry rocky and gravelly limestone barrens and boggy depressions in limestone barrens, Cape Norman, July 18, 1925, *Wiegand, Griscom & Hotchkiss*, nos. 28,433, 28,434, August 13, 1925, *Wiegand & Long*, no. 28,440; dry limestone barrens, Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,432, August 5, 1925, *Fernald & Long*, no. 28,439.

Although I have not seen the Drummond material upon which Hooker founded *Braya alpina*, β. *americana*, there is scarcely any question that the plant of northern Newfoundland with small pinkish flowers and hirtellous siliques is identical with the Drummond plant. After detailed study I placed the Newfoundland material close to *B. alpina* Sternb. & Hoppe of the European alps. From that species it differs in its narrower leaves, mostly shorter pedicels and sepals, much narrower petals with rounded rather than emarginate apex, slender and columnar rather than tumid style, broader and sharply defined stigma, and shorter lance-subulate rather than linear-cylindric siliques. The only material at hand from the region whence Drummond collected the type of *B. alpina*, β. *americana* is Stewardson Brown, no. 1457. That material is so close to the Newfoundland plant that at least until one knows more about it, it would be quite unwise to attempt to separate them. Brown's material is in anthesis, Drummond's was in fruit; but the one point emphasized by Hooker, "stylo longiusculo gracili", is clearly shown in it.

O. E. Schulz[1] places *B. alpina*, β. *americana* with doubt under the Siberian *B. siliquosa* Bunge; but, as he clearly states, Bunge's species has linear siliques up to 1.5 cm. long. These are well shown by Trautvetter,[2] who also illustrates the leaves as broadly oblanceolate and definitely toothed. The American plant with its more slender and strictly entire leaves and its very short siliques is certainly not *B. siliquosa*. See pp. 96, 97, 98, 106.

? Braya Richardsonii (Rydb.) Fern. Sandy and clayey spots in limestone gravel-barrens, Boat Harbor, *Fernald, Wiegand & Long*, no. 28,441, very scarce, only two sterile plants found, but apparently the Canadian Rocky Mt. species. See p. 107.

[1] O. E. Schulz in Engler, Pflanzenr. iv.[105] 231 (1924).
[2] Trautv. Imag. Descr. Fl. Ross. 34, t. 23 (1844).

(*To be continued.*)

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND.

M. L. Fernald.

(*Continued from p. 204.*)

Tillaea aquatica L. Sandy and peaty margin of pond back of barrier beach, Argentia, *Fernald, Long & Dunbar*, no. 26,737, new to Newfoundland. See p. 86.

Saxifraga rivularis L. Wet quartzite rocks and seepy banks along upper Deer Pond Brook, Highlands of St. John, *Fernald & Long*, no. 28,453; wet mossy cliffs, lower Deer Pond Brook, *Gilbert & Hotchkiss*, no. 28,455; cool damp pockets in rocky crests, Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 28,454. See pp. 116, 121. Previously reported only from St. Anthony.

S. stellaris L., var. comosa Poir. Crests of wet quartzite cliffs along upper Deer Pond Brook, Highlands of St. John, *Fernald & Long*, no. 28,464, new to Newfoundland. See p. 117.

Parnassia Kotzebuei C. & S. Mossy brooksides and damp turfy slopes, Sacred Island, *Fernald & Long*, no. 28,475; mossy and turfy trap cliffs and talus, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,476; limestone cliffs, western face of Doctor

Hill, Highlands of St. John, *Fernald & Long*, no. 28,477; new to Newfoundland. See pp. 122, 123, 125.

P. PARVIFLORA DC. Extending northward on the West Coast to St. Barbe Bay. See p. 79.

PARNASSIA **multiseta** (Ledeb.), n. comb. *P. palustris, β. multiseta* Ledeb. Fl. Ross. i. 263 (1842).

Ledebour's only character for his *P. palustris, β. multiseta* was the numerous (15–23) setae or filaments to each staminodial scale. Ledebour cited two specimens, one collected by Frisch near Baschurow on the Argun River, the other collected by Rieder in Kamtchatka. Material of Rieder's collection is in the Gray Herbarium and in its petals as well as in the staminodial scales it is quite like the American plant which passes as *P. palustris* but unlike true *P. palustris* of Europe and much of Asia. The contrasts between the two are indicated below.

P. PALUSTRIS L. Calyx-lobes subcoriaceous, lanceolate, elliptic or narrowly obovate, obtuse, 4–7 mm. long, 7–13-nerved: petals rounded or emarginate at tip, conspicuously 7–13-nerved, with brownish lines: anthers 2.3–3 mm. long: staminodial scale longer than broad, abruptly contracted to a long narrow claw, with 9–15 filaments: capsule with a short slender beak: seeds linear-oblong, dark-brown.

P. MULTISETA (Ledeb.) Fern. Calyx-lobes subherbaceous, linear to lance-oblong, subacute, (4–) 6–11 mm. long, 3–7-nerved: petals narrowed to rounded, only rarely emarginate at tip, faintly 5–9-nerved, with paler lines: anthers 1.5–2.3 mm. long: staminodial scale as broad as or broader than long, tapering to a short broad base, with 9–23 filaments: capsule beakless: seeds short-oblong to oval, pale-brown.

The following specimens of *P. multiseta* are before me.—LABRADOR: Flint Island, near Port Manvers, August 22, 1908, *Owen Bryant;* Hopedale, 1920, *W. W. Perrett;* Esquimaux Island, Hamilton Inlet, *Bowdoin College Exped.* no. 275. UNGAVA: Ungava River, *Spreadborough*, no. 14,280. NEWFOUNDLAND: brooksides on slaty hills back of Little Quirpon, *Fernald & Gilbert*, no. 28,481; marsh back of strand near Isthmus Cove, Pistolet Bay, *Wiegand, Gilbert & Hotchkiss*, no. 28,480; sandy, gravelly and turfy upper border of beach, Cook Point, Pistolet Bay, *Fernald, Gilbert & Hotchkiss*, no. 28,482; wet places, Flower Cove, August 2, 1920, *M. E. Priest;* turfy limestone barrens, Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,749; springy swale south of the Hospital, Flower Cove, *Fernald, Long & Dunbar*, no. 26,750; turfy limestone shore, St. Barbe, *Fernald, Long & Dunbar*, no. 26,751; turfy shore of Derby's Tickle, at mouth of Otter Pond Brook, Brig Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,483. ONTARIO: Maitland, Huron Co., 1869, *W.*

White; Pic River, *Loring;* clay soil, Onaman River, Thunder Bay Distr., 1912, *Pulling,* Michigan: Isle Royale, *Cooper*, no. 122. Manitoba: Churchill, *J. M. Macoun*, no. 79,233. Minnesota: Turtle Lake, August, 1892, *Sheldon;* Clithwall, July, 1897, *Campbell.* North Dakota: boggy meadows, Devil's Lake, July 30, 1838, *Nicollet;* low meadows, Turtle Mountains, July 23, 1902, *Lunell.* Mackenzie: Slave River, July 30, 1892, *Elizabeth Taylor.* Saskatchewan: without locality, 1858, *Bourgeau;* 20 miles west of Yorkton, *Herriot*, no. 70,747. Alberta: Milk River, *John Macoun*, no. 10,569; Banff, *Canby*, no. 85. British Columbia: Rocky Mts. lat. 49° N., 1861, *Lyall.* Yukon: Whitehorse, *Eastwood*, no. 624; Dawson, 1896, *Kusche;* Carmacks, *Eastwood*, no. 570. Alaska: along river, Skagway, *Eastwood*, no. 771; Kodiak, *Kellogg*, no. 226; Attu Island, *J. M. Macoun*, no. 86; lower Kuskakwim River, August, 1898, *F. C. Hinckley;* bank of Anvik River, *Chapman*, no. 22; near Fort Selkirk, Yukon River, *Schwatka*, no. 99; Fort Yukon, July 13, 1902, *H. E. Brooks;* Cape Blossom, 1884, *McLenegan;* Cape Nome, 1900, *Blaisdell;* St. Michaels, 1865–66, *Bannister;* Kotzebue Sound, *Chamisso;* Eschscholtz Bay, *Chamisso.* Kamtchatka: without locality, *Rieder* (co-type of *P. palustris*, *β. multiseta*); Bering Island, 1883, *Steineger.*

Sibbaldia procumbens L. Wet quartzite rocks and gravel along brook, Southwest Gulch, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,505, new to Newfoundland. See p. 124.

Potentilla pectinata Raf. Dry limestone cliffs, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 28,517; otherwise known in Newfoundland only at Chimney Cove. See p. 125.

P. nivea L. Typical *P. nivea* with the leaflets griseous-sericeous above: dry rocky and gravelly limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 28,525; limestone cliffs and ledges on western slope, under summit, Bard Harbor Hill, Highlands of St. John, *Wiegand, Gilbert & Hotchkiss*, no. 28,526; dry white limestone bluff opposite western escarpment of Bard Harbor Hill, *Fernald & Long*, no. 28,533. Previously collected on Pointe Riche and on Cape St. George. See p. 117.

P. nivea, var. macrophylla Ser. The commoner American variety, with dark-green upper leaf-surfaces. Dominant on calcareous cliffs, slopes and barrens from Sacred Bay to St. John Bay. Previously collected on Table Mt., Port-à-Port Bay. See p. 125.

Potentilla **usticapensis,** n. sp., caudex crassus multiceps caudiculis brevibus caespitose congestis stipulis peliis emortuis dense vestitis; caulibus floriferis procumbentibus subscaposis 1–9 cm. longis 1–3-floris villoso-lanatis; foliis radicalibus breviter petiolatis 1–2.5 cm. longis uni- vel bijugis; stipulis infimis flavido-brunneis aliquando

purpurascentibus scariosis glabris breviter adnatis auriculis anguste ovatis; foliolis superioribus duobus inferioribus multo majoribus cuneato-obovatis profunde incisis, segmentis utrinque 2–3 linearioblongis obtusis margine revoluto subtus albis densissime villoso-lanatis vel tomentosis supra densissime villoso-lanatis vel glabrescentibus; calycibus villoso-lanatis 0.6–1 cm. latis 5–6 mm. longis, sepalis externis oblongis obtusis brevioribus quam internis anguste ovatis subacutis; petalis rotundato-obovatis apice truncatis vel emarginatis calyce vix longioribus ochroleucis; staminibus 20, filamentis vix 1 mm. longis, antheris subrotundatis 0.4 mm. longis; receptaculo breviter piloso; acheniis anguste ovoideis olivaceis 1.3–1.5 mm. longis numerosis, stylo subterminale 0.5–0.7 mm. longo basi papilloso-incrassato.—NEWFOUNDLAND: in gravel of dry limestone barrens, northern half of Burnt Cape, Pistolet Bay, July 17, 1925, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,518 (TYPE in Gray Herb.); dry gravel of limestone barrens, southern half of Burnt Cape, August 5, 1925, *Fernald & Long*, no. 28,519.

Very close to the arctic *P. pulchella* R. Br. and especially to var. *Sommerfeltii* (Lehm.) Th. Wolf (*P. Sommerfeltii* Lehm.). But those plants, which Wolf and the students of the floras of Spitzbergen and of Greenland merge as variants of one species, are characterisized by long straight lustrous sericeous pubescence of leaves, stems and calyx, the pubescence of *P. usticapensis* being opaque and densely villous-lanate. *P. pulchella*, furthermore, has the segments of the leaflets narrower and more acute than in *P. usticapensis;* its sepals (both inner and outer) less obtuse; its petals yellow rather than creamy and its style-bases more papillose. On Burnt Cape the new species was associated in the dry limestone gravel with a remarkable series of highly localized species, including *Festuca supina* Schur, *Poa alpina* var. *brevifolia* Gaudin, *Carex glacialis* Mackenzie, *Arenaria cylindrocarpa* Fern., *Lesquerella arctica* (Wormsk.) Wats., *Braya americana* (Hook.) Fern. and *Crepis nana* Richardson; while in more turfy or peaty spots were *Carex concinna* R. Br., *Habenaria straminea* Fern., *Astragalus alpinus* L. and *A. eucosmus* Robinson, *Oxytropis foliolosa* Hook., *Arctostaphylos rubra* (Rehder & Wilson) Fern., *Antennaria eucosma* Fernald & Wieg., *A. albicans* Fern., *A. spathulata* var. *continentis* Fern. & St. John, and local species of *Arnica* and *Taraxacum*. See p. 103.

POTENTILLA NORVEGICA L., var. **labradorica** (Lehm.), n. comb. *P. labradorica* Lehm., Ind. Sem. Hort. Bot. Hamb. 1849: 12 (1849). *P. monspeliensis*, var. *labradorica* (Lehm.) Fernald, RHODORA, x. 50 (1908). *P. norvegica*, var. *hirsuta*, forma *labradorica* (Lehm.) Wolf,

Mon. Gatt. Pot. 404 (1908).—A fairly marked geographic variety. In Newfoundland known only from turfy shore, Big Brook, *Fernald & Long,* no. 28,536.

P. norvegica and *P. monspeliensis* were published by Linnaeus on the same page. They were maintained as varieties of *P. norvegica* by Lehmann in 1856 and it was apparently not until 1898 that they were united (by Rydberg) under the name *P. monspeliensis.* By the International Rules the name *P. norvegica* must stand.

P. ALPESTRIS Hall. f. Dominant on peaty or turfy calcareous slopes and barrens from Sacred Bay to Ingornachoix Bay; also on Cape St. George (*Mackenzie & Griscom*). See pp. 91, 98, 118.

ALCHEMILLA VULGARIS L., var. VESTITA (Buser) Fernald & Wiegand. Wet quartzite rocks and gravel along brook, Southwest Gulch, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss,* no. 28,580, the second station in Newfoundland. See pp. 54, 124.

ASTRAGALUS **stragulus,** n. sp., depressus, caulibus filiformibus ramosissimis repentibus stragulos 3–4 dm. diametro formantibus; ramulis filiformibus adscendentibus 0.3–1.7 dm. longis glabris vel sparse strigosis; stipulis oblongo-lanceolatis vel ovatis 2–4 mm. longis; foliis petiolatis divergentibus, petiolis rhachibusque compresso filiformibus strigosis 2–6 cm. longis, foliolis 4–9-jugis ellipticis retusis 0.2–1 cm. longis 1–5 mm. latis glabris vel subtus strigosis; pedunculis filiformibus axillaribus 0.2–9 cm. longis glabris vel strigosis; floribus lilacinis patentibus 1–10, racemo sub anthesi congesto fructifero plus minusve laxo 1–4 cm. longo; bracteis subscariosis lanceolato-attenuatis nigro-strigosis pedicellum brevissimum superantibus; calycibus nigro-strigosis dentibus anguste deltoideis vel lanceolatis subulato-attenuatis brevioribus 1–2 mm. longis, tubo oblique campanulato 2.5–3 mm. longo; corollis 0.8–1.2 cm. longis; vexillo rotundato-obovato obcordato 0.8–1 cm. longo 7–8 mm. lato; alis cum ungue 4–5 mm. longis, lamina anguste obovata ungue duplo longiore superne 2.5 mm. lata basi auriculata, auricula oblonga obtusa 1 mm. longa; carinis 9–10 mm. longis lamina unguem aequante subacutis apice 2 mm. latis; ovario hirtello, legumine sessile vesicario oblongo-ovoideo nigro-strigoso 6–8 mm. longo 2.5–4 mm. diametro uniloculari apiculato, apiculo erecto; seminibus 5–8 inequilateralibus olivaceis vel brunneis 1.3–1.8 mm. longis.—NEWFOUNDLAND: sandy and turfy upper border of limestone beach, Cook Point, Pistolet Bay, July 18, 1925, *Fernald & Gilbert,* no. 28,583; August 13, 1925, *Fernald, Gilbert & Hotchkiss,* no. 28,584 (TYPE in Gray Herb.).

A beautiful species of the subgenus *Homalobus,* forming dense carpets and very attractive when in flower, the peduncles varying from only a few millimeters to nearly a decimeter in length, and bearing, when well developed, close racemes of lilac flowers. A.

stragulus is closely related to *A. yukonis* Jones, Revis. N. A. Astrag. 89 (1923), a species of similar habit from the Yukon. Jones's description is very contradictory, he stating in the key that *A. yukonis* has "Leaves sessile, very many. Leaflets 6–8 pairs," but in the detailed description "Leaves. . . all rather long-petioled . . . . Leaflets 3–5 pairs." Fortunately one of the numbers he cites, *Eastwood*, no. 626, is before me and this differs in many details from *A. stragulus*. Its leaflets are fewer, in Miss Eastwood's material ranging from 3–6 pairs, narrower, cinereous and only exceptionally retuse (in *A. stragulus* 4–9 pairs, retuse, and glabrous above); its peduncles are all elongate, 0.5–1 dm. long (in *A. stragulus* very variable, 0.2–9 cm. long); the racemes promptly becoming lax and remotely flowered (in *A. stragulus* only the lowest flowers becoming slightly remote in age); the flowers smaller and strongly ascending (the larger flowers of *A. stragulus* widely divergent); the standard only about 5 mm. long and with strongly revolute margins (the flat and broader standard of *A. stragulus* 0.8–1 cm. long); the keel much shorter but with a longer and obtuse erect tip; the pods said to be 2–3-seeded, the tip not strongly bent upward (in *A. stragulus* the 5–8-seeded pod with the point abruptly upturned and erect). See p. 106.

ASTRAGALUS ALPINUS L. Dry limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,585; turfy and rocky slopes, Quirpon Island, *Wiegand Gilbert & Hotchkiss*, no. 28,586, *Fernald & Long*, no. 28,587; previously known in Newfoundland only from Chimney Cove. See pp. 104, 121.

A. EUCOSMUS Robinson. Dominant on turfy slopes and barrens or on slate, trap or limestone talus and gravel from Quirpon Island to Boat Harbor. See p. 104. The corolla is normally deep-violet but it is, exceptionally, white in

A. EUCOSMUS, forma **albinus**, n. f., petalis lacteis.—NEWFOUNDLAND: springy meadow at base of Ha-Ha Mountain, Ha-Ha Bay, July 17, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,588 (TYPE in Gray Herb.).

In typical *A. eucosmus* the calyx is densely strigose with usually dark hairs, but on the banks of the Exploits River in east-central Newfoundland there occurs an extreme with glabrous calyx. This may be distinguished as

A. EUCOSMUS, var. **facinorum**, n. var., a forma typica recedit floribus remotis, calycibus glabris.—NEWFOUNDLAND: ledges and talus, north bank of Exploits River below the falls, Grand Falls, July 3,

1911, *Fernald, Wiegand, Bartram & Darlington*, no. 5795 (TYPE in Gray Herb.).

A. BLAKEI Eggleston. Limestone cliffs, ledges and talus, western escarpments of Bard Harbor Hill, Highlands of St. John, *Wiegand, Gilbert & Hotchkiss*, no. 28,597; *Fernald & Long*, no. 28,593; a species of northern New England new to Newfoundland. See p. 117.

OXYTROPIS FOLIOLOSA Hook. Dry gravelly limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,599; dry limestone gravel, Schooner (Brandy) Island, *Pease & Long*, no. 28,600; sandy and turfy upper border of limestone beach, Cook Point, *Fernald & Gilbert*, no. 28,601; the first from east of the Rocky Mts. See pp. 103, 105, 106.

O. CAMPESTRIS (L.) DC., var. JOHANNENSIS Fernald. Not previously recognized from Newfoundland, though already collected. The Newfoundland specimens are as follows. Dry crests of trap cliffs, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,604; shelves, crests and talus of diorite cliffs, Ha-Ha Mountain and Ha-Ha Point, *Pease & Griscom*, no. 28,602, *Fernald & Long*, no. 28,603; dry limestone cliffs and talus, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 28,605; conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, *Fernald & Wiegand*, no. 3633; high sea-cliffs, Chimney Cove, *Waghorne*. See pp. 104, 125.

HEDYSARUM ALPINUM L. Dominant on turfy or peaty slopes or on calcareous cliffs and talus the length of the Straits from Quirpon Island to Savage Cove. See pp. 76, 104. Previously known from Cow Head and from the limestones of Port-à-Port and Cape St. George.

H. ALPINUM, var. AMERICANUM Michx. Calcareous cliffs and talus, western escarpments of Doctor Hill and Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, nos. 28,626, 28,627, the first from north of Bay of Islands. See p. 125.

LATHYRUS MARITIMUS (L.) Bigel., var. ALEUTICUS Greene. Gravelly and turfy strand near Isthmus Cove, Pistolet Bay, *Wiegand, Gilbert & Hotchkiss*, no. 28,631, the first from south of Labrador. See p. 120.

CALLITRICHE HETEROPHYLLA Pursh. Pools near the eastern end of the Straits, from Quirpon Island to Sacred Island, an extension north from the Exploits. See p. 120.

C. HERMAPHRODITICA L. (*C. autumnalis* L.). In dead water near tide-limit, East Brook, St. Barbe Bay, *Wiegand & Hotchkiss*, no. 28,643, the first station north of the Humber. See p. 127.

NEMOPANTHUS MUCRONATA (L.) Trel. Local and scarce on slopes of the Highlands of St. John, our first stations north of Bay of Islands.

ACER SPICATUM Lam. Slopes of the Highlands of St. John, our first stations north of Bonne Bay.

VIOLA NEPHROPHYLLA Greene. Common in damp peaty soil, northward to the Straits. See p. 90.

V. SELKIRKII Pursh. Peaty slopes and woodland knolls, Quirpon Island and Highlands of St. John, extensions northward from Bay of Islands.

V. PALUSTRIS L. Swale at mouth of Eddies Cove Brook, *Fernald, Wiegand & Long*, no. 28,662, the first Newfoundland station. See p. 108.

V. RENIFOLIA Gray. Thickets bordering limestone barrens, southern half of Burnt Cape, *Fernald & Long*, nos. 28,666, 28,667, the first from Newfoundland, where var. BRAINERDII (Greene) Fern. is generally distributed along the West Coast. See p. 120.

EPILOBIUM ANGUSTIFOLIUM L., var. INTERMEDIUM (Wormsk.) Fern. Turfy clearings and pastures, Quirpon Island, *Fernald & Long*, no. 28,676; previously known in Newfoundland only from Grand Lake.

E. NESOPHILUM Fern. Mossy larch swamp on flat north of Doctor Hill, St. John Bay, *Fernald & Wiegand*, no. 28,684, northern extension from the Exploits Valley. See p. 127.

E. PYLAIEANUM Fern. RHODORA, xxvii. 33 (1925). Widely dispersed in southern Newfoundland. For citation of specimens see Fern., l. c. See p. 84.

E. PALUSTRE L., var. MANDJURICUM Hausskn. Springy swamp, Sandy Cove, Ingornachoix Bay, *Fernald, Long & Dunbar*, no. 26,860; glades and wet woods near base of Bard Harbor Hill and boggy limestone strand, Bard Harbor, St. John Bay, *Fernald & Long*, no. 28,696, *Wiegand & Gilbert*, no. 28,699; the first records from America. See p. 80.

E. PALUSTRE,. var. LABRADORICUM Hausskn. Mossy barren hillside back of Cape Ray, *Fernald, Long & Dunbar*, no. 26,856; wet slaty cliffs, John Kanes's Ladder, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 28,686*a*; previously known in Newfoundland only from tundra at Little River, *Mackenzie & Griscom*, no. 11,191.

E. PALUSTRE, var. LAPPONICUM Wahlenb. Dripping mossy quartzite cliffs and ledges, upper Deer Pond Brook, Highlands of St. John, *Fernald & Long*, nos. 28,697, 28,698; springy ditch bordering spruce thicket, Savage Cove, *Fernald & Long*, no. 28,701; new to Newfoundland. See p. 116.

E. WYOMINGENSE A. Nels. Swales, bogs and glades on limestones of the West Coast: Flower Cove, *Fernald, Long & Dunbar*, nos. 26,857. 26,859; Brig Bay, *Fernald, Long & Dunbar*, no. 26,858; Ingornachoix Bay, *Fernald & Wiegand*, no. 3728; Cow Head, *Fernald & Wiegand*, no. 3727; Cape St. George, *Mackenzie & Griscom*, no. 10,355; the first records from east of the Rocky Mts. See p. 60.

E. DAVURICUM Fisch. Peaty and turfy brooksides, borders of pools or damp depressions in limestone barrens, Quirpon Island to St. John Island: Quirpon Island, *Fernald & Long*, no. 28,708; Big Brook, *Pease & Griscom*, no. 28,703; Sandy (Poverty) Cove, *Fernald, Long &*

Gilbert, no. 28,706; Savage Cove, *Fernald, Pease & Long*, no. 28,704; St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,707; the first from eastern America. See pp. 100, 118.

E. LEPTOCARPUM Hausskn., var. (?) MACOUNII Trel. Gravelly shore of pond in limestone rock-barrens near Rock Marsh, Flower Cove, *Fernald, Pease & Long*, no. 28,705; wet peat along trail in coniferous woods, lower southwestern slope of Bard Harbor Hill, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,687; the first in eastern America. See p. 109.

E. BREVISTYLUM Barbey. Springy slopes and brooksides at head of Mauve Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,720; springy ditch bordering spruce thicket, Savage Cove, *Fernald & Long*, no. 28,713; the first in eastern America. See p. 123.

E. BOREALE Hausskn. Springy ditch bordering spruce thicket, Savage Cove, *Fernald & Long*, no. 28,712; glades and rich thickets, slopes of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, nos. 28,719, 28,722, 28,723; bushy swale on flat north of Doctor Hill, St. John Bay, *Fernald & Wiegand*, no. 28,721. Except for stations in the Shickshock Mts. these are the first in eastern America. See p. 117.

E. DRUMMONDII Hausskn. Turfy slope near mouth of Big Brook, *Fernald & Long*, no. 28,725; mossy glades and banks, Eddies Cove *Fernald, Wiegand & Long*, no. 28,726; springy mossy bank, Savage Cove, *Fernald, Long & Gilbert*, no. 28,727. A Rocky Mountain species heretofore known in the East only from the Torngat Mts. of Labrador and Tabletop Mts., Gaspé. See pp. 99, 108.

EPILOBIUM **scalare**, n. sp., perenne, rhizomate elongato obliquo crassiusculo, ad collum gemmas bulbiformes sessiles hypogaeas obovoideas 5–10 mm. longas edente; caule e basi arcuata erecto 0.5–3.5 dm. alto crasso simplici vel plerumque in parte media superiore ramoso, ramis perbrevibus arcte adscendentibus fastigiatis, glabro subdense foliato multifloro, lineis 2 elevatis pilosiusculis e marginibus foliorum decurrentibus notato; foliis inferioribus oppositis reliquis alternatis subapproximatis pallide viridibus subcarnosis utrinque glaberrimis patentibus vel reflexis ellipticis vel anguste oblongo-ovatis breviter petiolatis basi rotundatis vel angustatis apicem versus angustatis subacutis mediis 3–6 cm. longis 1.2–2.5 cm. latis margine denticulis minimis callosis vix repandis munitis; alabastris anguste ovoideis subacutis basi sparse pilosis; floribus erectis 5–6 mm. longis; calycis laciniis ovato-lanceolatis acutiusculis tubo crispo-piloso; petalis purpureis calyce $\frac{1}{3}$ longioribus; stigmate clavato; capsulis junioribus crispo-pilosis glabratis deinde 4–6 cm. longis pallide viridibus, pedicellis brevissimis 2–3 mm. longis; seminibus anguste ovoideo-oblongis apice pellucido-appendiculatis basin versus sensim attenuatis acutis 1.4 mm. longis, 0.4 mm. latis, testa tenuiter denseque papillosa.—NEWFOUNDLAND: wet slaty cliffs, John Kanes's Ladder, western face

of Doctor Hill, Highlands of St. John, August 24, 1925, *Fernald & Long*, no. 28,728 (TYPE in Gray Herb.).

Nearest related to *E. saximontanum* Hausskn. of the cordilleran region of northwestern America. That, however, as described by Haussknecht, has a slender rhizome (in *E. scalare* rather thick and stout); simple stem "a span" high (in *E. scalare* fastigiate or bushy-branched and taller); remote leaves only 2–3 cm. long and at most 1 cm. wide (in *E. scalare* 3–6 cm. long, 1.2–2.5 cm. wide); the buds and calices glabrous (in *E. scalare* crisp-pilose), the petals pale (in *E. scalare* purple); and the young capsules glabrous (in *E. scalare* crisp-pilose). The seeds of *E. scalare* are apparently very similar to those of *E. saximontanum*. The latter species is not well represented in American herbaria, and I have been forced to interpret it merely from Haussknecht's description.

Epilobium scalare may eventually prove to be identical with *E. saximontanum* or some species of northwestern America; but I have been unable to place it satisfactorily with any of them. The flora of western Newfoundland is rich in *Epilobium*—seventeen species and ten varieties thus far known—and these include besides the circumpolar species such western American types as *E. wyomingense* A. Nelson, *E. boreale* Hausskn., *E. brevistylum* Barbey, *E. Drummondii* Hausskn., *E. leptocarpum* var. *Macounii* Trel., and *E. Behringianum* Hausskn. See p. 126.

E. LACTIFLORUM Hausskn. Brooksides on slaty hills back of Little Quirpon, *Fernald & Gilbert*, no. 28,730; mossy brooksides, Sacred Island, *Fernald & Long*, no. 28,731; cold wet chimneys in trap cliffs, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,732; wet quartzite rocks and seepy banks along upper Deer Pond Brook and in Southwest Gulch, Highlands of St. John, *Fernald & Long*, no. 28,739, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,733; new to Newfoundland. See pp. 117, 122.

E. BEHRINGIANUM Hausskn. Springy mossy bank, Savage Cove, *Fernald, Long & Gilbert*, no. 28,734; a species of northeastern Asia and adjacent Alaska, here found for the first time in eastern America. See p. 109.

E. ALPINUM L. (*E. anagallidifolium* Lam.). Glades and damp thickets, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,736, new to Newfoundland. See p. 103.

MYRIOPHYLLUM ALTERNIFLORUM DC. Frequent from Brig Bay to Savage Cove, an extension northward from Bay of Islands. See p. 127.

M. EXALBESCENS Fern. Common from Brig Bay to Pistolet Bay, an extension north from Pointe Riche. See p. 127.

SANICULA MARILANDICA L., var. **borealis,** n. var. a var. typica recedit floribus stamineis majoribus sepalis 1.3–2 mm. longis pedicellis crassis subereo-angulatis vel -clavatis; fructu 6–8 mm. longo.—Newfoundland to northern New York. NEWFOUNDLAND: spruce thickets, Boat Harbor, Straits of Belle Isle, July 19, 1925, *Fernald, Wiegand & Long*, no. 28,765; meadow below limestone escarpment, western face of Bard Harbor Hill, Highlands of St. John, August 27, 1925, *Fernald & Long*, no. 28,766; damp talus of limestone sea-cliffs, Pointe Riche, August 4, 1910, *Fernald & Wiegand*, no. 3765; wet runs and boggy spots, Ingornachoix Bay, August 2, 1910, *Fernald & Wiegand*, no. 3764; marsh at base of Gros Morne, Bonne Bay, August 13 and 14, 1919, *R. H. Kimball*, no. 74; park-like openings in woods, Birchy Cove (Curling), July 21, 1910, *Fernald & Wiegand*, no. 3763; woods, Wild Cove, July 16, 1896, *Waghorne;* banks of Exploits River near Badger Brook, August 13, 1894, *B. L. Robinson;* ledges and talus, Grand Falls, July 22, 1911, *Fernald, Wiegand, Bartram & Darlington,* no. 5950; shaded bank of Salmon River, Glenwood, July 12, 1911, *Fernald, Wiegand & Darlington*, no. 5951; damp bushy ravine in limestone tableland, Table Mountain, Port-à-Port Bay, August 16, 1910, *Fernald & Wiegand*, no. 3766. QUEBEC: alluvial woods, St. John (or Douglastown) River, August 23, 1904, *Collins, Fernald & Pease;* alluvial thickets and woods near mouth of Dartmouth River, August 26 and 27, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.); dans la prairie au sommet des falaises du Gros-Ruisseau, Rivière-aux-Rénards, Juil. 14, 1923, *Victorin et al*, no. 17,318; coniferous forest, "Low's Trail" from River Ste. Anne des Monts to Table-Topped Mt., August 14, 1906, *Fernald & Collins*, no. 678; alluvium of Bonaventure River, August 4–8, 1904, *Collins, Fernald & Pease;* alluvial thickets, Little Cascapedia River, July 29 and 30, 1904, *Collins, Fernald & Pease;* Matane River, August 5, 1904, *F. F. Forbes;* Little Métis, August 16, 1906, *Fowler;* shore of Lake Temiscouata, August, 1914, *Victorin*, no. 518; Lower Caché River, Lac Tremblant, August 2, 1922, *Churchill.* PRINCE EDWARD ISLAND: swampy woods, Tignish, August 6, 1912, *Fernald, Long & St. John,* no. 7852. NEW BRUNSWICK: cliffs, St. John River, Connors, July 13, 1903, *Pease*, no. 2260; Little Island, Shediac Bay, August 5, 1914, *Hubbard.* MAINE: Fort Fairfield, July 16, 1902, *Williams, Collins & Fernald.* NEW YORK: Canton, July 17, 1914, *Phelps*, no. 726.

In typical *Sanicula marilandica* of the eastern United States and the southern edges of Canada the staminate flowers are smaller, with sepals 1–1.5 mm. long, the pedicels filiform and usually more elongate than in the northern extreme, and the fruits average slightly shorter, varying from 5–7 mm. in length. Var. *borealis* usually has a tendency

to firmer or somewhat fleshy or leathery leaves; but in none of the characters is it absolutely separable. In northern New England some of the plants are transitional, but all the material from farther north, in Gaspé and Newfoundland, seems fairly constant in its thickened pedicels and larger calyx and, when mature, in its usually larger fruit.

Osmorhiza divaricata Nutt. Alluvial woods north of Doctor Hill, St. John Bay, *Fernald & Long*, no. 28,771, new to Newfoundland. See p. 125.

Cicuta bulbifera L. Locally in swales along the Straits from Flower Cove to Boat Harbor, an extension north from Bay of Islands.

Heracleum Sphondylium L. A dominant weed of fields and fencerows, Trepassey, *Fernald, Long & Dunbar*, no. 26,886. See p. 84.

Conioselinum Gmelini (Bray) Steud. Nom. ed. 2, i. 403 (1840). *Selinum Gmelini* Bray, Denkschr. Bot. Ges. Regensb. i. pt. 2: 36 (1818).

Certain collections from Newfoundland and the Gaspé Peninsula, with the upper stipules gradually narrowed from base to summit, rather than broadly dilated as in *C. chinense* (L.) BSP., and with the leaves very finely dissected, seem to be quite inseparable from the plant of arctic Eurasia which there regularly passes as *C. Gmelini* (see p. 117). *C. Gmelini* (Bray) Steud. is quite distinct from the plant of western North America which was christened *C. Gmelini* (C. & S.) Coult. & Rose, Cont. U. S. Nat. Herb. vii. 150 (1900), based upon *Ligusticum Gmelini* Cham. & Schl. Linnaea, i. 391 (1826). In view of Steudel's combination, properly made in a well-known work and clearly listed in *Index Kewensis*, there was no call for the later combination. The plant of western America, which has larger fruits and much longer and coarser involucels than *C. Gmelini* (Bray) Steud., should be called

Conioselinum **Benthami** (Wats.), n. comb. *Selinum Benthami* Wats. Bibl. Ind. 432 (1878). *Ligusticum Gmelini* Cham. & Schl. Linnaea, i. 391 (1826). *C. Gmelini* Coult. & Rose, Contrib. U. S. Nat. Herb. vii. 150 (1900), not Steud. (1840).

The specific characters in *Conioselinum* are not well worked out but everyone who has watched the genus in the region of Gaspé and Newfoundland realizes that with us it is a complex group. In this region there seem to be at least four species: *C. chinense* (L.) BSP., *C. Gmelini* (Bray) Steud., *C. pumilum* Rose, and a fourth species (known from a single collection from Tabletop Mts., Gaspé) with

coarse and elongate involucels, near to if not identical with *C. Benthami* (Wats.) Fern. of Alaska; but until more time can be given to study of their technical characters it is wisest to defer the presentation of a formal key to them.

ANGELICA **laurentiana**, n. sp., *A. atropurpureae* similis; caulibus 1–2 m. altis viridibus vix purpurascentibus glabris; segmentis terminalibus foliorum imorum valde confluentibus; umbellis hemisphericis primariis 1.3–2.5 dm. latis radiis 28–45 subrigidis crassis dense griseo-puberulis floribus exclusis 5–10 cm. longis; involucellis nullis vel bracteis lineari-setaceis vel lineari-oblanceolatis pedicellos subaequantibus vel superantibus; pedicellis maturis 0.6–1.4 cm. longis griseo-puberulis: fructu late oblongo vel oblongo-suborbiculato basi apiceque rotundato 5.5–10.5 mm. longo glabro; jugis tribus dorsalibus alatis, alis dorsalibus laterales subaequantibus.—Northwestern Newfoundland and eastern Saguenay County, Quebec. NEWFOUNDLAND: trap cliffs and talus, Anse aux Sauvages, Pistolet Bay, August 11, 1925, *Fernald, Wiegand & Long*, nos. 28,784 (TYPE in Gray Herb.), 28,785; rocky meadows and brook-bottoms, upper Deer Pond Brook, Highlands of St. John, July 28, 1925, August 20, 1925, *Fernald & Long*, nos. 28,782, 28,783. QUEBEC: meadow, Tabatière, Boishébert, August 14, 1915, *St. John*, no. 90,626 (distributed as *Coelopleurum actaeifolium*).

Angelica laurentiana is at once distinguished in mature fruit from *A. atropurpurea* L. by the thin wings of the dorsal ridges, the dorsal ridges in *A. atropurpurea* being low, blunt-edged and wingless. In *A. atropurpurea* the ripe fruit is 5.5–7.5 mm. long, in *A. laurentiana* it may be as short but is commonly 8–10.5 mm. long. In *A. atropurpurea* the stem is usually suffused with purple and the umbels are inclined to be spherical, with the outer rays strongly reflexed, and the upper segments of the lowest leaves are commonly distinct or only slightly confluent. In *A. laurentiana* the stem may be purplish but it is more commonly green; the rays of the umbel ascend or are at most horizontally divergent and the upper segments of the lowest leaves are strongly confluent. In *A. atropurpurea* the involucels, when present, are commonly much shorter than the pedicels; in *A. laurentiana* they are often nearly as long as or even longer than the pedicels.

In its fruit *A. laurentiana* is nearer to *A. ampla* A. Nelson of the Rocky Mountain region of Wyoming and Colorado; but the latter has the fruits smaller and with lower scarcely winged dorsal ridges. In their key Coulter & Rose[1] define *A. atropurpurea* as having "In-

[1] Contrib. U. S. Nat. Herb. vii. 154 (1900).

florescence glabrous" and in their detailed description states that the umbel is "15 to 25-rayed." Such an account is difficult to reconcile with the plants, for every specimen of *A. atropurpurea* in the Gray Herbarium and the herbarium of the New England Botanical Club has the rays and pedicels copiously puberulent and the primary or leading umbels all have 22–46 rays.[1] See p. 117.

PYROLA SECUNDA L., forma **eucycla**, n. f., a f. typica recedit foliis rotudatis vel rotundo-ellipticis.—NEWFOUNDLAND: mossy spruce woods north of Doctor Hill, St. John Bay, August 24, 1925, *Fernald & Long*, no. 28,801.

Forma *eucycla* is an extreme form of *P. secunda*, var. *vulgaris* Herder, and should not be confused with var. *obtusata* Turcz. Typical *P. secunda* has the bracts at the base of the stem lanceolate, strongly involute and firm; the firm leaf-blades dark-green and rather lustrous, crenate-serrate, 1.5–6 cm. long; the scapes 1–2 dm. high; racemes 6–20-flowered, in anthesis 2–5, in fruit up to 8.5 cm. long; the petals greenish-yellow; the mature style 5–9 mm. long. The usually very distinct var. *obtusata* differs in having the basal bracts oblong to ovate, but slightly involute, membranaceous; the leaf-blades membranaceous, pale-green, hardly lustrous, crenate, 0.8–3 cm. long; the scapes 0.5–1.5 dm. high; the racemes 2–10-flowered, in anthesis 0.5–3, in fruit up to 4 cm. long; petals creamy-white; mature style 4–6 mm. long.

In all its technical points forma *eucycla* belongs with typical *P. secunda*, which, however, has the leaves narrowed at tip.

RHODODENDRON CANADENSE (L.) BSP. Shrubby barren near the Yellow Marsh back of Bard Harbor, St. John Bay, *Gilbert & Hotchkiss*, no. 28,824, an extension north from Bay of Islands.

PHYLLODOCE CAERULEA (L.) Bab. Abundant on peaty and turfy quartzite, upper slopes of Bard Harbor Hill, Highlands of St. John, the third Newfoundland station. See p. 116.

CASSIOPE HYPNOIDES (L.) D. Don. Turfy and mossy quartzite rocks along Mans Humbug Brook, Highlands of St. John, very scarce, *Fernald & Long*, no. 28,839, the second Newfoundland station. See p. 124, where I spoke of it as new to Newfoundland, overlooking Eames & Godfrey's discovery of it on Blomidon.

ARCTOSTAPHYLOS RUBRA (Rehder & Wilson) Fernald. Turfy or peaty limestone barrens along the Straits: Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,853,

[1] The first station cited by Coulter & Rose is likewise difficult to reconcile with geographic fact: "VERMONT: Alpine region of the White Mountains, *Oakes*."

Fernald & Long, no. 28,855; Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 28,854, *Wiegand & Long*, no. 28,856; Big Brook, *Fernald & Long*, no. 28,852; Yankee Point, *Fernald, Wiegand & Long*, no. 28,857; new to Newfoundland. See p. 99.

Vaccinium nubigenum Fernald. Dry scrub at margin of quartzite barren near summit of Bard Harbor Hill and heathy banks near upper Deer Pond Brook, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,872, *Fernald & Long*, nos. 28,873, 28,874; previously known only from the Shickshock Mts. See pp. 116, 124.

V. ovalifolium Sm. Open spruce thickets, Boat Harbor, *Fernald, Wiegand & Long*, no. 28,875; abundant in the thickets and gulches of the Highlands of St. John. See pp. 107, 116, 124. Previously known on the North Peninsula only from Croque (*Banks, LaPylaie*).

Statice labradorica (Wallr.) Hubb. & Blake, var. submutica Blake. Dominant on limestone barrens from Pistolet Bay to St. John Bay; previously known on the West Coast south to Lewis Hills.

Primula farinosa L. Fairly typical *P. farinosa* is represented by specimens from crests of trap cliffs, Sacred Island, *Wiegand, Gilbert & Hotchkiss*, no. 28,908; turfy and peaty pockets in limestone ledges, Sandy (Poverty) Cove, *Fernald, Long & Dunbar*, no. 26,955; Flower Cove, *M. E. Priest*, no. H1. See pp. 60, 75.

P. farinosa, var. americana Torr. Wet limestone ledges and gravel near the sea, St. Barbe, *Fernald, Long & Dunbar*, no. 26,956.

P. farinosa, var. incana (M. E. Jones) Fern. Turfy limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss.* no. 28,905; gravelly limestone shore, Schooner (Brandy) Island, *Pease & Long*, no. 28,907; limestone barrens, Yankee Point, *Wiegand, & Hotchkiss* no. 28,904; turfy limestone barrens, Dog Peninsula, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,913.

P. farinosa, var. macropoda Fern. Abundant on the West Coast.

P. sibirica Jacq., var. arctica Pax. Gravelly and peaty limestone barrens back of Big Brook, *Fernald & Long*, no. 28,915; sandy and gravelly margin of Big Brook, *Fernald, Wiegand, Long & Gilbert*, no. 28,916; swale near mouth of brook, Watts Bight, *Pease, Griscom, Gilbert & Hotchkiss*, no. 28,901; wet banks, turfy limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 28,918; wet hollows and pond-shores in limestone gravel-barrens, Cook Point, *Fernald & Gilbert*, no. 28,917, *Fernald, Gilbert & Hotchkiss*, no. 28,919; the first records from eastern America. See pp. 98, 99, 105.

P. egaliksensis Wormsk. Abundant in swales or on peat in the calcareous region from Sacred Island to St. John's Island. See pp. 54, 60, 75, 118.

Gentiana propinqua Richardson. Dominant on turfy and

gravelly limestone shores and cliffs from Quirpon Island to Ingornachoix Bay. See pp. 54, 60, 79, 80.

Lamium purpureum L. Completely occupying a garden-site at head of Mauve Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,958, new to Newfoundland.

Limosella aquatica L. Shallow fresh pool back of beach, Harbour Breton, *Fernald, Long & Dunbar*, no. 27,013. Otherwise known in eastern America only from the southeastern corner of the Labrador Peninsula. See p. 87.

Gratiola aurea Muhl. Gravelly margin of Junction Pond, Whitbourne, *Fernald, Long & Dunbar*, no. 27,014; discovered at the same station in 1911, *Fernald & Wiegand*, no. 6143; the only station known in Newfoundland. See p. 86. The material collected on August 8, 1911, and August 25, 1924, is very dwarf and shows no sign of flowering.

(*To be continued*)

TWO SUMMERS OF BOTANIZING IN NEWFOUNDLAND

M. L. Fernald.

(*Continued from p. 225.*)

Veronica alpina L., var. unalascensis C. & S. Wet quartzite rocks and gravel along brook, Southwest Gulch, Highlands of St. John, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,965, new to Newfoundland. See p. 124.

V. humifusa Dickson. Wet limestone barrens, slopes and cliffs, general on the West Coast.

Euphrasia. The collections of the past two seasons render a complete revision of the American species necessary. This cannot now be presented.

Bartsia alpina L. Damp turf or peaty limestone barrens or talus from Pistolet Bay westward to Half-way Brook; new to Newfoundland. See pp. 105, 106

Pedicularis flammea L. Wet hollows in gravelly limestone barrens one mile back of Savage Cove, *Fernald & Long*, no. 29,034; gravelly and peaty limestone barrens back of Big Brook, *Fernald & Long*, no. 29,035; limestone talus near Half-way Brook, *Pease, Gris-*

com, Gilbert & Hotchkiss, no. 29,036; new to Newfoundland. See pp. 96, 98.

P. PALUSTRIS L. Long known from the region of St. John's; seen from the train in swales and sloughs southward to Petty Harbor. See p. 81.

P. SYLVATICA L. Collected for the first time in America in 1911 by Fernald & Wiegand. Characteristic of peaty slopes and mossy woodland glades from Carbonear to St. John's and vicinity. See pp. 51, 81.

UTRICULARIA GEMINISCAPA Benj. Shallow peaty pool back of strand, Bard Harbor, St. John Bay, *Fernald & Long,* no. 29,042, northward extension from Bay of Islands.

OROBANCHE (APHYLLON) **terrae-novae,** n. sp., *O. uniflora* simulans; calycibus campanulatis 0.7–1.3 cm. longis extus pilosis, lobis anguste deltoideis acuminatis vel caudatis 4–8 mm. longis; corollis 1.7–2.5 cm. longis arcuatis lacteis vel pallide lilacinis, laciniis oblongis valde ciliatis, ciliis 0.5 mm. longis; floribus inodoris.—NEWFOUNDLAND: gravelly shore of dead-water in Gander River, Glenwood, July 12 and 13, 1911, *Fernald & Wiegand,* no. 6212; springy places in ledges and gravel, north bank of Exploits River, Grand Falls, July 4, 1911, *Fernald, Wiegand, Bartram & Darlington,* no. 6211; under *Picea canadensis,* cool springy glade, interior of southern half of Burnt Cape, Pistolet Bay, August 5, 1925, *Fernald & Long,* no. 29,051, swampy spruce (*Picea canadensis*) woods and thickets, Bard Harbor, St. John Bay, July 29, 1925, *Wiegand, Gilbert & Hotchkiss,* no. 29,049 (TYPE in Gray Herb.); mossy glades in spruce woods, western slope of Bard Harbor Hill, August 26, 1925, *Fernald & Long,* no. 29,053; mossy glades in spruce woods, north of Doctor Hill, St. John Bay, August 24, 1925, *Fernald & Long,* no. 29,052; turfy slopes and steep banks, St. John's Island, St. John Bay, July 31, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss,* no. 29,050; boggy thickets back of Birchy Cove (Curling), July 7, 1910, *Fernald & Wiegand,* no. 4018; talus slope of the marble region between Mt. Musgave and Humber Mouth, July 18, 1910, *Fernald & Wiegand,* no. 4019; woods, Coal River, July 21, 1896, *Waghorne;* Log Cabin, Harry's River, July 11, 1902, *L. L. Dame.*

Orobanche terrae-novae is perhaps merely a geographic variety, but all Newfoundland material, in good flower, has the oblong segments of the corolla with much longer ciliation than in the continental *O. uniflora* L., in which the segments are broader and usually obovate. *O. uniflora* has deliciously fragrant flowers, *O. terrae-novae* odorless, and the calyx of the latter is more copiously pilose than in the former. In *O. terrae-novae* the lower lip has 2 linear yellow lines at the throat; whether they occur in *O. uniflora* cannot at present be stated.

In his very detailed *Monographie der Gattung Orobanche,* Beck von

Mannagetta recognizes only two members of the section *Aphyllon*. The herbarium-material indicates that the section is much more complex, and certainly the species of Pacific North America with linear-subulate or setaceous calyx-segments and purple-violet corollas is quite distinct from the eastern *O. uniflora*. The western plant is

Orobanche (Aphyllon) **Sedi** (Suksd.), n. comb. *Aphyllon Sedi* Suksd. Deutsch. Bot. Monatss. xviii. 155 (1900). *A. uniflorum*, var. *occidentale* Greene, Man. Bay Reg. 285 (1894). *Thalesia purpurea* Heller, Bull. Torr. Bot. Cl. xxiv. 313, t. 310 (1897), not *O. purpurea* Jacq. (1762). *A. minutum* Suksd. l. c. (1900). not *O. minuta* Beck von Man. (1890). *Thalesia minuta* (Suksd.) Rydb. Bull. Torr. Bot. Cl. xxxvi. 692 (1909).

Galium saxatile L. Stony margins of spring-rills by roadside in peaty barrens and about cold spring-head at border of spruce thicket in bog-barrens, Trepassey, *Fernald, Long & Dunbar*, nos. 27,085, 27,086, its first stations in America. See p. 83.

Galium Brandegei Gray. Springy slopes and brooksides at head of Mauve Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,070, new to Newfoundland. See p. 123.

Mitchella repens L. Border of wet spruce thicket among gneiss hills, very rare, Port aux Basques, *Fernald, Long & Dunbar*, no. 27,097, the first authenticated record from Newfoundland. See p. 56.

Eupatorium maculatum L., var. foliosum (Fern.) Wieg. Meadow below calcareous sandstone escarpments, western face of Bard Harbor Hill and meadow by brook, Bard Harbor, St. John Bay, *Fernald & Long*, no. 29,093, *Wiegand & Gilbert*, no. 29,094, an extension north from Harry's River. See p. 124.

Solidago lepida DC. Meadow below limestone escarpment, western face of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, nos. 29,117, 29,118, the second station for the typical form of the species. See p. 124.

S. graminifolia (L.) Salisb., var. Nuttallii (Greene) Fern. Dry gravelly slopes near Goose Pond, Whitbourne, *Fernald, Long & Dunbar*, no. 27,129. Previously known only from Clarenville.

Erigeron acris L., var. **arcuans**, n. nom. *E. alpinus* β. Hook. Fl. Bor.-Am. ii. 18 (1834). *E. acris*, var. *debilis* Gray, Syn. Fl. i. pt. 2: 220 (1884) as to Labrador and Hudson Bay plants only. *E. elatus* Greene, Pittonia, iii. 164 (1897), not *E. alpinus* γ *elata* Hook. l. c. *E. acris*, var. *oligocephalus* Fernald & Wiegand, Rhodora, xii. 226 (1910), in large part, but not as to type.

When *E. acris*, var. *oligocephalus* was described two quite different plants were confused under it. The type from Blanc Sablon has much larger heads than the others and later collections from the Newfoundland side of the Straits of Belle Isle show it to be specifically separable from the smaller-headed plant which Hooker called *E.*

alpinus β. and which Greene well described as *E. elatus*. The latter name is quite inappropriate and, as was shown in the original discussion of *E. acris*, var. *oligocephalus*, Greene was in error in identifying his plant with *E. alpinus*, ϒ *elata* Hook.

The type of *E. acris*, var. *oligocephalus* belongs, according to Dr. Ostenfeld and Mr. Erling Porsild who have independently been over the Newfoundland collections of 1925 with me, to

E. BOREALIS (Vierh.) Simmons, Acta Univ. Lund., n. s. ix. no. 19: 127 (1913). Outside of Greenland *E. borealis* is known in America only from LABRADOR: limestone and calcareous sandstone terraces, Blanc Sablon, *Fernald & Wiegand*, no. 4138 (type of *E. acris*, var. *oligocephalus*). NEWFOUNDLAND: Quirpon Harbor, September 8, 1923, *A. G. Huntsman;* slaty cliffs and talus, Cape Raven, August 12, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,139. See pp. 54, 123.

ANTENNARIA EUCOSMA Fern. & Wieg. Dominant on turfy limestone barrens and slopes from Pistolet Bay westward to Four-Mile Cove; previously known only from Table Mt., Port-à-Port Bay and from Cape St. George. See pp. 98, 105.

A. CANA (Fern. & Wieg.) Fern. Dominant on gravelly limestone barrens, Pistolet Bay to Ingornachoix Bay, and more locally to Bay St. George. See pp. 62, 96, 103, 105.

A. VEXILLIFERA Fern. Turfy limestone barrens, Cook Point, *Fernald & Gilbert*, no. 29,171; dry mixed gravel on crest southeast of Boat Harbor, *Fernald, Wiegand & Long*, no. 29,172. Previously known only from the Shickshock Mts. See pp. 105, 107.

ANTENNARIA **Longii** n. sp., humifusa, stolonibus foliosis confertis perbrevibus (ad 1 cm. longis); foliis basilaribus late spathulatis vel anguste cuneato-obovatis apice rotundatis vix mucronatis 5–11 mm. longis 2.5–4 mm. latis supra albidis, tomento denso minuto; caule florifero 1–6 rarissime deinde –9 cm. alto; foliis caulinis 4–8 subdistantibus, imis oblanceolatis obtusis, mediis linearibus 0.7–1.5 cm. longis 1–1.5 mm. latis subulato-mucronatis, superioribus 1–4 apice scarioso oblongo-lanceolato 1.5–2 mm. longo munitis; capitulis femineis 1–6 corymbosis turbinato-campanulatis; involucro 7–10 mm. alto basi lanato; bracteis 2–3-seriatis subaequalibus tenuissimis, exterioribus oblongis basi castaneis apice sordidis squarrosisque, interioribus fulvis oblongo-lanceolatis acuminatis adscendentibus; corolla 4–4.5 mm. longa; stylo flavescenti deinde brunneo; planta mascula ignota.—Straits of Belle Isle, NEWFOUNDLAND: dry limestone gravel, Schooner (or Brady) Island, Pistolet Bay, July 18, 1925, *Pease & Long*, no. 29,177 (TYPE in Gray Herb.); dry limestone rock-barrens, Boat Harbor, July 19, 1925, *Fernald, Wiegand & Long*, no. 29,178; gravelly limestone barren, Four-Mile Cove, July 20, 1925, *Fernald, Wiegand & Long*, no. 29,179; dry gravel of limestone

barrens, Cape Norman, August 13, 1925, *Wiegand & Long*, nos. 29,180, 29,181.

A. Longii is nearest related to *A. vexillifera* Fernald, but is at once distinguished by its larger heads; broader involucral bracts, the outer series with strongly squarrose tips; and the few appendaged cauline leaves. *A. vexillifera*, originally described from the Shickshock Mts. of Gaspé but now known from northwestern Newfoundland as well, has the fulvous hemispheric-campanulate involucre only 6–7 mm. long; its uniformly ascending bracts narrower than in *A. Longii;* and all but the lowest cauline leaves tipped by a long scarious appendage. See p. 106.

A. STRAMINEA Fern. Local on the West Coast, previously known northward to Pointe Riche. Our recent collections are: dry limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,168; turfy crests of limestone barrens, Shoal Cove, *Pease & Griscom*, no. 29,176; dry gravelly limestone barren, Savage Point, *Fernald, Wiegand, Pease, Long, Gilbert & Hotchkiss*, no. 29,175; open spots in limestone barrens near Ice Point, St. Barbe Bay, *Wiegand, Gilbert & Hotchkiss*, no. 29,167; dry limestone barrens, Brig Bay, *Fernald, Long & Dunbar*, no. 27,187; dry gravelly limestone barrens, St. John's Island, *Fernald, Wiegand, Long, Gilbert, & Hotchkiss*, no. 29,170. See pp. 79, 97, 105.

A. ALBICANS Fern. Very local on the West Coast, previously known only fron Table Mt., Port-à-Port Bay. The new stations are: dry limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,164; dry limestone gravel, Schooner (Brady) Island, *Pease & Long*, no. 29,166; dry gravel of limestone barren, Cook Point, *Fernald & Gilbert*, no. 29,165; dry limestone gravel near Ice Point, St. Barbe Bay, *Wiegand, Gilbert & Hotchkiss*, no. 29,161. See pp. 97, 105.

ANTENNARIA **Wiegandii**, n. sp., humifusa, stolonibus foliosis (ad 2 cm. longis); foliis basilaribus anguste cuneato-obovatis apice obtusis mucronatis 6–13 mm. longis 2–4 mm. latis supra viridibus sparse arachnoideis vel glabratis; caule florifero 5–13 cm. alto gracili; foliis caulinis 7–10, imis confertis lineari-oblanceolatis mucronatis, mediis linearibus 7–10 mm. longis 1–1.5 mm. latis apice unguiculato-subulatis, superioribus 4–6 apice scarioso lanceolato 2–3 mm. longo munitis; capitulis femineis 2–4 corymbosis hemisphaerico-campanulatis basi rotundatis; involucro 6 mm. alto basi lanato; bracteis 2–3-seriatis, exterioribus anguste oblongis obtusis adscendentibus basi castaneis apice fulvis, interioribus lanceolatis fulvis; corolla 4.5 mm. longis apice purpurascentibus; acheaniis 1.2 mm. longis; planta mascula ignota.—NEWFOUNDLAND: turfy limestone barrens, St. John's Island, St. John Bay, July 31, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,153.

A. Wiegandii is the nearest approach yet found south of northern Labrador to the arctic *A. alpina* (L.) Gaertn. In the distinctly mucronate basal leaves it is very similar to *A. alpina*, all the other small-leaved species of Newfoundland and Gaspé having blunt basal leaves. *A. alpina*, however, has much narrower and more elongate rosette-leaves which are narrowed to tip; the upper cauline leaves have broader appendages; the corymb, except in var. *ungavensis*, is denser; the heads are larger (involucre 7–9 mm. high); and the achenes are longer (1.3–1.5 mm. long).

In the green upper surfaces of the basal leaves *A. Wiegandii* resembles *A. spathulata* Fernald, but it is at once distinguished by the smaller leaves with less rounded, but more mucronate tips; more crowded and assurgent stolons; looser inflorescence, with smaller heads (involucres of *A. spathulata* 7–10 mm. high) with much narrower and darker involucral bracts, and shorter corollas and achenes (in *A. spathulata* the corollas 5.5–6 mm. long, the achenes 1.4–1.7 mm. long).

A. SPATHULATA Fern. Turfy limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,182; turfy slopes and steep banks bordering limestone barrens, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,183; northern extension from Pointe Riche. See p. 105.

A. SPATHULATA, var. CONTINENTIS Fern. & St. John. Turfy limestone barrens, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,184; previously known only from Natashquan, Saguenay Co., Quebec, See p. 105.

ANAPHALIS MARGARITACEA (L.) B. & H., var. SUBALPINA Gray. Gravelly bank near sea, Cape Onion, *Fernald*, no. 29,186, a northern extension from Bonne Bay; the solitary colony locally famous as a curiosity.

GNAPHALIUM NORVEGICUM Gunn. Wet quartzite rocks and seepy banks in gulches of Highlands of St. John: Deer Pond Brook, *Fernald & Long*, nos. 29,187, 29,189; Southwest Gulch, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,190. Turfy barrens and slopes, Sacred Island, *Wiegand, Gilbert & Hotchlkiss*, no. 29,188. New to Newfoundland. See pp. 116, 122.

TANACETUM HURONENSE Nutt., var. TERRAE-NOVAE Fern. Dominant on turfy or gravelly limestone barrens and slopes from Pistolet Bay to Ingornachoix Bay. See pp. 54, 80, 100.

ARTEMISIA BOREALIS Pall. Dry gravelly limestone barrens, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,203; previously known in Newfoundland only from Table Mt., Port-à-Port Bay and from Cape St. George. See p. 118.

Arnica terrae-novae Fern. Turfy limestone barrens, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,209, *Fernald & Long*, no. 29,210 ½; turfy limestone barrens, Cook Point, *Fernald & Gilbert*, no. 29,214; peaty and bushy areas on limestone barrens one mile back of Savage Cove, *Fernald & Long*, no. 29,207, *Fernald, Pease & Long*, no. 29,208; previously known only from Cape St. George. See pp. 96, 103, 105.

A. pulchella Fern. Turfy limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 29,213; mossy talus of diorite cliffs, Ha-Ha Mountain, *Fernald & Long*, no. 29,215; previously known only from Table Mt., Port-à-Port Bay. See pp. 96, 106, 120.

A. chionopappa Fern. Turfy limestone barrens, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,209 ½, *Fernald & Long*, no. 29,210; turfy limestone barrens, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,211; dry white limestone bluff opposite western escarpment of Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, no. 29,212; previously known in Newfoundland only from Table Mt., Port-à-Port Bay and from Cape St. George. See pp. 96, 103, 118.

A. Griscomi Fern. Crests of turfy slopes and steep banks bordering limestone barrens, St. John's Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,216; previously known only from the Shickshock Mts., Gaspé. See p. 118.

Senecio pauciflorus Pursh. Turfy slopes of slaty hills, Little Quirpon, *Wiegand, Gilbert & Hotchkiss*, no. 29,218; peaty and turfy brookside east of the central valley of Quirpon Island, *Fernald & Long*, no. 29,219; slaty cliffs and talus, Cape Raven, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 29,221; mossy brookside, Sacred Island, *Fernald & Long*, no. 29,220; calcareous cliffs and talus, western faces of Doctor Hill and Bard Harbor Hill, Highlands of St. John, *Fernald & Long*, nos. 29,222, 29,223; the first authenticated records from Newfoundland. See pp. 121, 125.

Taraxacum. The indigenous species of *Taraxacum* are very numerous in the ancient flora of unglaciated northwestern Newfoundland. Some, like T. lapponicum Kihlm. (p. 60) and T. ceratophorum (Ledeb.) DC. (p. 76), are well known circumpolar species; others, like T. lacerum Greene (p. 60) and T. dumetorum Greene are species previously known only from the Rocky Mts.; T. latilobum DC. (p. 80) is endemic; and several others are apparently local endemics. A series is being studied by Dr. Handel-Mazzetti and a detailed report upon them cannot yet be given.

Lactuca (Mulgedium) **terrae-novae** n. sp., biennis, caule erecto glabro robusto simplici 1 m. alto; foliis glabris runcinato-pinnatifidis elliptico-ovatis, mediis 1.5–2 dm. longis 1–1.2 dm. latis acuminatis lobis oblique ovatis horizontaliter divergentibus grosse dentatis,

superioribus apice caudatis; capitulis racemoso-paniculatis; involucris urceolato-campanulatis valde calyculatis 1.2–1.5 cm. altis, bracteis exterioribus ovatis acutis interioribus lanceolatis obtusis apice arcuatis; corollis coerulescentibus deinde purpurascentibus; achaeniis oblique lanceolato-oblongis rufescentibus 5–6 mm. longis 1–1.4 mm. latis in rostrum firmum 1 mm. longum attenuatis; pappo niveo.—NEWFOUNDLAND: meadow below limestone escarpment, western face of Bard Harbor Hill, Highlands of St. John, August 21, 1925, *Fernald & Long*, no. 29,290.

Lactuca terrae-novae is known from only a single plant. When Mr. Long and I found it we took three specimens, but upon maturing in press two of them prove to be typical *L. spicata* (Lam.) Hitch., which is frequent in western Newfoundland; but the third specimen departs at once from the others in its white pappus, orange-brown or reddish unmottled achenes and definite slender but firm beak; *L. spicata* having sordid pappus, grayish-brown to blackish conspicuously mottled achenes and stouter neck. It may prove, when the new plant is better known, that it is an extreme of *L. spicata*. If so, the characters of pappus and beak, which have so long proved constant in the genus will have most singularly lost their constancy. No species of *Lactuca* other than these two are known in Newfoundland; *L. terrae-novae* cannot, therefore, be considered a hybrid. See p. 124.

CREPIS NANA Richardson. Dry limestone barrens, very scarce, northern half of Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 29,278; previously known in eastern America only from the Torngat region of northern Labrador. See pp. 103, 104.

HIERACIUM GROENLANDICUM Almq. Thicket by Big Brook, *Fernald & Long*, no. 29,267; thickets on slaty hills back of Little Quirpon, *Fernald & Gilbert*, no. 29,268; also noted (immature) on Burnt Cape; the mature plant from Little Quirpon is a close match for authentic Greenland material. See pp. 99, 121.

H. CANADENSE Michx., var. HIRTIRAMEUM Fern. Glades near brook, Bear Cove, *Wiegand & Pease*, no. 29,275; glades in spruce thickets bordering limestone barrens, Yankee Point, *Fernald, Wiegand & Long*, no. 29,270; northward extension from Port-à-Port Bay and the Exploits Valley.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
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LXXVII

RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—VI

#44869

By B. L. Robinson

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RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE,—VI.

THE present paper presents such new *Eupatorieae* as have been found in collections examined by the writer during the past year. To the diagnoses needful to put these on record, there have been added a few notes regarding species and varieties appearing to require further elaboration or new interpretation.

The chief material studied during the preparation of this paper has been as follows: 1. More than 1400 sheets of American *Compositae-Eupatorieae* from the herbarium of the University of Copenhagen, an important loan (mentioned in the preceding issue of these notes) bringing to America for the first time authentic material of many species founded upon the collections of Liebmann, Oersted, and Warming. 2. A loan of about 130 *Eupatorieae* for study and identification from the Museum of Natural History at Paris, a collection rich in Cordilleran species of rarity and interest. 3. About 150 Eupatoriums and related plants from the Dr. Ekman's intensive exploration of Cuba, a collection forwarded to the writer for study and determination through the kindness of Prof. I. Urban of the Botanical Museum at Berlin and found to contain one new genus and many new species of unusual interest. 4. Portions (not previously elaborated) of the admirable collections made by Messrs. Pennell, Killip & Hazen in western Colombia in 1922, by Messrs. Macbride and Featherstone in Peru in 1922 and continued by Mr. Macbride in 1923. 5. Some *Eupatorieae* from Ecuador, sent by the Rev. Father L. Mille, containing plants of much interest obtained in part by himself and in part from the duplicates of the herbarium of the late Father Sodiro. 6. Remarkable collections of *Eupatorieae* made by Mr. P. C. Standley and assistants in Costa Rica in 1925 and 1926, including probably the best representation of the epiphytic Eupatoriums ever secured, and including also a singular trifoliolate species. 7. Dr. F. W. Pennell's recent Peruvian and Chilian collection of 1924–25 bringing several novelties and excellent material of some plants heretofore known only from fragmentary specimens obtained by the early collectors more than a century ago. 8. The admirable collection of Dr. I. M. Johnston from northern Chile, bringing an interesting novelty in the genus *Ophryosporus*. 9. A loan from the Field Museum including novelties collected by Dr. Weberbauer in Peru and by Mr. Steinbach in Bolivia. 10. Portions of several large loans mentioned in previous issues of these notes. 11. Several

Eupatorieae, collected recently in the mountains of the State of Chiapas, Mexico, by Dr. C. A. Purpus and forwarded to the writer by Dr. J. N. Rose of the U. S. National Museum.

The wealth of this new material, requiring both critical identification and the description of many novelties, has been so great as seriously to delay several revisions partially in hand, and in consequence their completion must be reserved for another season.

Piqueria galioides DC. Prod. v. 105 (1836); Robinson, Proc. Am. Acad. xlii. 11 (1906). This has been known only from a fragmentary specimen in the Prodromus Herbarium of DeCandolle. It was collected by Haenke in 1834 somewhere in the mountains of Peru, but no more precise data have been available as to the source of the plant in question. It is accordingly well worthy of record that two sheets of this species have been found in the Peruvian collection of Dr. Francis W. Pennell, which localize the plant for the first time, since its characterization as a species. Their labels yield the following information: herb, with greenish-brown flowers, on open rocky slope, at Quive, Dept. of Lima, alt. 800–1500 m., June 9, 1925, *Pennell,* no. 14,308 (Gr.); plant suffrutescent below, with greenish-yellow flowers, on open rocky slopes, along the Rio Chillón, near Viscos, Dept. of Lima, alt. 1800–2000 m., June 10–15, 1925, *Pennell,* no. 14,475 (Gr.).

The flower-color, as stated by the collector, seems to refer chiefly to the phyllaries and is not wholly constant, being probably, at least to some extent, correlated with the degree of maturity, perhaps also to exposure. In no. 14,308 the leaves are in part quite as alternate as in the fragmentary type, but elsewhere on the same individual they are sub-opposite or even precisely opposite. In no. 14,475 all but the uppermost are opposite. It is obvious that differences in leaf-arrangement have here little diagnostic significance. Though the heads are sessile the inflorescence is in this species looser than in the related Piquerias.

Ophryosporus (§ **Euophryosporus**) **Johnstonii,** spec. nov., fruticosus intricate ramosus compactus subglobosus 1 m. altus; caulibus firmiter lignosis ad 3 mm. vel ultra diametro pallide griseis valde nodosis; ramis adscendentibus gracilibus subappresse puberulis aliquando subspinoso-induratis; ramulis patenter adscendentibus; foliis alternis saepissime fasciculatis rhombeo-ovatis obtusis utroque latere 1–2-dentatis vel integris basi cuneatis glabris vel subglabris carnosis 5–7 mm. longis 2–3 mm. latis breviter crassiuscule petiolatis;

inflorescentiis terminalibus et lateralibus spiciformibus plerisque 2–5 cm. longis et 9–14 mm. crassis folioso-bracteatis; capitulis parvis 3–4-floris ca. 7 mm. longis sessilibus; involucri squamis oblongis viridibus glabris vel obscure subappresseque puberulis apice rotundatis ca. 4 mm. longis; corollis flavescentibus tubulatis ca. 4 mm. longis sine faucibus distinctis extus puberulo-scabratis; dentibus limbi ca. 0.6 mm. longis; achaeniis atrobrunneis 2.7 mm. longis apicem versus granuliferis; pappi setis ca. 30 albidis barbatis corollam subaquantibus.—CHILE: Prov. Antofagasta, Dept. Taltal: compact bush 1 m. tall, in rocky wash below springs, Aguada Panul, Dec. 4, 1925, *Johnston*, no. 5424 (TYPE, in Gray Herb.); side of rocky narrow quebrada, Miguel Diaz, Dec. 3, 1925, *Johnston*, no. 5314 (Gr.); on rocky slopes in quebrada, Aguada Cardon, Nov. 30, 1925, *Johnston*, no. 5259 (Gr.).

This species is clearly a near relative of *O. triangularis* Meyen, but differs in its fewer-flowered heads, smoothish leaves and phyllaries, more intricate branching and in the form of the inflorescence. Dr. I. M. Johnston, the discoverer of the species, states that at each of the three stations, where it was observed and collected, it grew in company with *O. triangularis* and was readily distinguishable as a different plant by its smaller heads, its somewhat different habit and especially by the form of the inflorescence. In *O. triangularis* the leafy spikes, or rather spike-like panicles, are symmetrical, erect, parallel, and distinctly terminal, while in the species here described the inflorescences are more obviously branched, the lateral branchlets spreading; the heads in *O. triangularis* are slender-pedicelled, while in *O. Johnstonii*, they are, with rare exceptions, sessile.

Ophryosporus (§ **Ophryochaeta**) **Steinbachii**, spec. nov., ut videtur fruticosus patenter ramosus; caulibus (ramisve) teretibus juventate molliter puberulis aetate glabratis atropurpureis; internodiis 3–8 cm. vel ultra longitudine; foliis oppositis vel rare subalternis anguste ovatis graciliter petiolatis; attenuato-acuminatis serratis basi obtusis vel rotundatis supra glaberrimis subtus paullo pallidioribus parce pubentibus paullo supra basin 3-nervatis 3–6 cm. longis 1.4–1.8 cm. latis; nervis venisque supra depressis subtus prominentibus; petiolo 6–10 mm. longo puberulo; paniculis terminalibus et lateralibus pyramidalibus plerisque 5–10 cm. longis 4–6 cm. crassis basin versus foliaceo-bracteatis breviter pubescentibus vel tomentellis; capitulis 4–4.5 mm. longis 5-floris; involucri squamis ca. 6 plerisque oblongis apice rotundatis eroso-ciliatis dorso glabris ca. 3 mm. longis et 1 mm. latis, intimis paullo angustioribus; corollis extus glanduloso-puberulis ca. 3 mm. longis viridescenti-albidis sursum gradatim

ampliatis sine differentiatione exacta in tubum et fauces; antheris exappendiculatis pubentibus; styli ramis valde recurvantibus apice nigrescentibus clavellatis; achaeniis 1.8–2 mm. longis apicem versus paullo papilloso-scabratis sed in angulis non hispidulis; pappi setis ca. 24 breviter barbellatis nec plumosis.—BOLIVIA: common in low thicket, Incachaca, Prov. Sacaba, Dept. Cochabamba, alt. 2500 m., Aug. 30, 1921, *José Steinbach*, no. 5726 (TYPE, Field Mus., phot. and small fragm. Gr.).

This species is clearly related to *O. Cumingii* (Sch.-Bip). Benth., which, however, has longer relatively narrower leaves more cuneate at base, a more leafy inflorescence, and more definite, subcylindric corolla-throat. *O. Steinbachii* differs from *O. Kuntzei* Hieron. in having shorter, blunter phyllaries, a somewhat looser inflorescence and smaller leaves wholly glabrous above. It is perhaps most nearly allied to *O. clavulatus* Griseb. but that geographically somewhat remote species has a more abruptly expanded corolla-throat, phyllaries slightly hirtellous dorsally, larger leaves, and achenes distinctly hispid on the angles.

Stevia Mandonii Sch.-Bip. Bull. Soc. Bot. Fr. xii. 81 (1865) and Linnaea, xxxiv. 535 (1865–66) without char. This dwarf Andean species, originally collected by Gilbert Mandon in 1860 near Mt. Sorata, at the considerable altitude of 3800 m., and now rediscovered both by Dr. Weberbauer and by Dr. Pennell in the Andes of the Department of Puno, Peru, at a similar or even greater height, seems never to have been described, and to have been left, like most of Schultz's proposed novelties, a mere supposition to be verified, characterized and keyed by others. The species appears to be a good one, indeed rather exceptionally well marked in this very difficult genus, by its unusually dwarf habit, small, elliptic, smoothish leaves and sessile glomerules. It may be put on legimate footing by the following character, drawn from an isotype (Mandon's no. 246 in the Gray Herbarium): Humilis prostrata perennis; radice e fibris fusco-brunneis numerosis subsimplicibus elongatis ca. 1 mm. diametro consistenti; caulibus gracilibus prostratis nodosis glandulari-puberulis usque ad 1 dm. longis ramosis vel simplicibus; ramis brevibus flexuosis adscendentibus apicem versus foliosis 2–4 cm. longis; foliis oppositis sessilibus vel brevissime petiolatis ellipticis apice obtusis vel saepius rotundatis basi rotundatis vel breviter cuneatis margine integerrimis vel supra mediam partem utroque 1–3-serrato-dentatis textura subcoriaceis utrinque viridibus concoloribus punctatis supra glabriusculis subtus parce hirtellis 10–15 mm. longis 5–7 mm. latis; petiolo

vix 1 mm. longo; glomerulis terminalibus inter folia sessilibus 1.4–2 cm. diametro; capitulis 5-floris ca. 12 mm. longis 6 mm. diametro, involucri cylindrati squamis 5 oblongis obtusis, exterioribus ca. 7.5 mm. longis et 1.8 mm. latis hispidulis, interioribus ca. 8.5 mm. longis et 2 mm. latis costa excepta glabriusculis tenuioribus; corollis ut videtur in tubo rubro-purpureis et in limbo roseo-albis 6.5 mm. longis; lobis limbi 5 oblongis obtusis patentibus ca. 1.7 mm. longis et 1 mm. latis; achaeniis 3.5 mm. longis sursum praecipue in angulis hispidulis; pappi aristis in achaeniis quatuor 19 ca. 7 mm. longis barbatis basi gradatim paullo ampliatis et lacerato-ciliolatis apicem versus purpureis; aristis in achaenio quinto 9 ca. 5 mm. longis et squamis 2–3 hyalinis laceratis ca. 0.7 mm. longis.—BOLIVIA: Department La Paz: Prov. Larecaja, on hills of the alpine region near Ancohuma in the neighborhood of Sorata, alt. 3800 m., Mar.–Apr. 1860, *Mandon*, no. 246 (Gr., K.); Department of Tarija (?) at Escayache, alt. 3500 m., *Fiebrig*, no. 3416 (Gr.). PERU: Department of Puno: common in open mats at Pucará, alt. 3700 m., *Weberbauer*, no. 431 (Berl., phot. and fragm. Gr.); prostrate perennial herb with pinkish white flowers, on rocky clay slope over limestone at Chuquibambilla, alt. 3900–4000 m., *Pennell*, no. 13,372 (Gr.).

This species is closest to *S. Bangii* Rusby, which, however, is a more erect plant, often as much as 2–3 or even 4 dm. high, with smaller lanceolate or lance-oval leaves, more exserted glomerules, heads about 1 cm. long, and incurved crisped non-glandular puberulence (wrongly stated by Rusby to be stellate). The two species are undoubtedly near relatives and it is possible *S. Mandonii* may ultimately be shown to represent merely an alpine and strongly modified form of *S. Bangii*, but this seems unlikely and until further material is secured the two can be kept sharply separated. Mandon's no. 246 *bis*, confused with his species by Schultz, really came from the neighborhood of La Paz and is precisely the erect, smaller leaved *S. Bangii*. *S. humilis* Hieron., an alpine Bolivian *Stevia* of somewhat similar foliage, has a totally different and much shorter pappus.

STEVIA SORATENSIS Hieron. in Engl. Bot. Jahrb. xxviii. 560 (1901). This striking species with very copious gland-tipped pubescence, deeply toothed leaves, and abundant, dense corymbs of purple flowers was founded upon Mandon's no. 245, collected in 1860 in dry places in thickets, alt. 2650 m., near Mt. Sorata, Bolivia. A somewhat less densely glandular-pubescent plant with similar character and seemingly conspecific, was collected on Sorata, May 1920, by *Ernesto Günther*, no. 8 (U. S.). It is worthy of note that what appears

to be a form of this beautiful species has now been collected also in PERU, as follows: open rocky bank, at Checapupe, Dept. of Cuzco, alt. 3400–3450 m., Apr. 22, 1925, *Pennell*, no. 13,536 (Gr.). Dr. Pennell states that the plant is a perennial herb with "true purple" flowers. The corollas (as well as the upper part of the phyllaries) retain, even in the dried state, a deep, exceedingly rich purple color. In pubescence, habit, foliage, branching and density of inflorescence, brevity of pedicels, basal thickening of the midribs of the phyllaries, in fact in a multitude of details the correspondence between the Peruvian and Bolivian plants is very exact. The only differences noted are the deeper coloration of the flowers (perhaps wholly the result of fading in the much older material of Mandon and of Günther), the slightly larger flowers and more puberulent achenes. In the presence of such close correspondence in other respects it is believed that these differences are merely formal.

Eupatorium (§ **Subimbricata**) **amethystinum,** spec. nov., erectum dense pilosum; caule tereti ad 8 mm. vel ultra diametro distincte lignoso cum pilis aliis brevibus glanduloso-capitulatis patentibus atropurpureis aliis usque 1–2 mm. longis moniliformibus tenuissimis induto; internodiis 6–8 cm. longis; foliis oppositis ovati-lanceolatis fere a basi cordata ad apicem acutum gradatim attenuatis conspicue et regulariter crenatis (dentibus plerisque 1–1.5 mm. altis et ca. 2 mm. latis) supra bullatissimis tomentellis viridibus subtus sericeo-lanatis subcinereis 6–11 cm. longis 2.5–5 cm. latis a basi palmatim breviter 5-nervatis aliter penniveniis; textura membranaceis; petiolo 2.5–3 cm. longo dense piloso; corymbo terminali composito planiusculo ca. 2 dm. diametro glanduloso-piloso; bracteolis filiformi-linearibus; capitulis ca. 12-floris ca. 12 mm. altis et 6 mm. diametro sessilibus vel breviter pedicellatis; involucri squamis bene 3–4-seriatim imbricatis peracutis, exterioribus viridibus laxe villosulis, interioribus sublaevibus lucidulis pulcherrime violaceo-amethystinis; corollis glabris graciliter tubulatis a basi ad limbum gradatim paullulo ampliatis ca. 6 mm. longis sine faucibus distinctis; dentibus limbi deltoideis ca. 0.6 mm. longis; achaeniis (immaturis) ca. 3.5 mm. longis in costis sursum hispidulis; pappi setis ca. 44 albis capillaribus barbellatis ca. 6 mm. longis.—ECUADOR: vicinity of Los Juntas, Sept. 28, 29, 1918, *Rose, Pachano & Rose*, no. 23,200 (TYPE, in Gray Herb.).

This species most nearly approaches *E. glutinosum* Lam. but differs in many respects, as for instance, in its broader, smaller, more highly colored, more attenuate, and decidedly more imbricate phyllaries, the pubescent upper surface of its leaves, etc.

E. AMYGDALINUM Lam., var. OXYCHLAENUM (DC.) Bak. in Mart. Fl. Bras. vi. pt. 2, 314 (1876). To the synonymy of this variety may be reduced the uncharacterized and doubtfully mentioned *E. goyazense* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 386 (1909), if one may judge correctly from an isotype (no. 21,590) of Glaziou's proposed species now in the herbarium of the Botanical Museum at Copenhagen.

E. (§ **Subimbricata**) **andinum**, spec. nov., ut videtur herbaceum (basi ignota) breviter patenterque purpureo-pubescens (pilis nodulosis nec capituliferis) erectum supra paniculatim ramosum 6 dm. vel ultra altitudine; caule ad 3 mm. diametro tereti brunneo; medulla alba; foliis caulinis oppositis basin versus in partem petioliformem alatam cuneato-angustatis et ad insertionem sessilem cordato-amplexicaulibus; parte laminae ampliata ovata acuta remote dentata tenui membranacea utrinque breviter pubescenti pennivenia sed cum venis proximalibus paullo robustioribus et approximatis ca. 7 cm. longa ca. 3 cm. lata; parte petioliformi integra ca. 1.5 cm. longa 2–5 mm. lata; capitulis graciliter pedicellatis ca. 7–8 mm. altis et 9 mm. diametro ca. 70-floris; involucri squamis 3–4-seriatim imbricatis valde inaequalibus, extimis ovatis obtusis ca. 1.2 mm. longis et 0.6 mm. latis herbaceis dorso pubescentibus; intermediis ovato-oblongis acutis subherbaceis apicem versus pubentibus 3–4 mm. longis 1.2 mm. latis; intimis linearibus attenuatis glabris stramineis 5 mm. longis 0.7 mm. latis; receptaculo convexo glabro 1.5 mm. diametro; corollis flavido-albis gracilibus glabris ca. 4 mm. longis; tubo proprio 2.7 mm. longo; faucibus turbinatis ca. 0.8 mm. altis; dentibus limbi oblongo-deltoideis 0.5 mm. longis; achaeniis 1.5 mm. longis pallidis glabris basi calcaratis.—PERU: Dept. Cuzco, Oct. 1839–Feb., 1840, *Claude Gay*, no. 959 (TYPE in hb. Mus. Nat. Hist. Paris, phot. and small fragm. Gr.).

In many characters near *E. pilluanense* Hieron. but with florets much more numerous, leaves toothed instead of entire, inner involucral scales acute, and achenes pale. In habit and in its low-convex receptacle this species somewhat recalls *E. nemorosum* Klatt, but that has still more numerous florets, more slender tubular corollas with much less faucal enlargement, blackish achenes and other differences.

E. (§ **Subimbricata**) **atrescens**, spec. nov., fruticosum 2–3 m. altum in exsiccatione brunneo-nigrescens; caule tereti breviter dense fulvescenteque tomentoso medulloso, internodiis 3–5 cm. longis; foliis oppositis lanceolato-oblongis utroque acutis vel acuminatis subremote

cuspidato-denticulatis penniveniis 5–13 cm. longis 1.5–3.4 cm. latis supra minute granulato-puberulis post exsiccationem nigrescentibus subtus post exsiccationem olivaceis fulvo-puberulis; petiolo 1.2–1.6 cm. longo; panicula composita terminali; partialibus pyramidatis densis divaricatis; pedicellis 0–2 mm. longis; capitulis ca. 10-floris ca. 9 mm. longis et 5 mm. diametro; involucri squamulis ca. 16 bene imbricatis ca. quadriseriatis acutis obscure ciliolatis plerisque 4–7-nervatis purpurascenti-brunneis, extimis deltoideo-ovatis 2 mm. longis 1 mm. latis, intermediis oblongo-ovatis 4–5 mm. longis 1.8–2 mm. latis, intimis anguste oblongis vel oblanceolato-linearibus 6 mm. longis 0.8–1.5 mm. latis; corollis 6 mm. longis glabris, tubo proprio gracili 3 mm. longo sursum in fauces turbinatas 2 mm. altas ampliato, dentibus limbi purpureis deltoideis 0.6 mm. longis; achaeniis immaturis glabris ca. 2.2 mm. longis; pappi setis ca. 75 sordide albis sublaevibus ca. 5.5 mm. longis.—ECUADOR: Prov. Loja: between San Lucas and Oña, alt. 2200–3100 m., Sept. 7, 1923, *Prof. A. S. Hitchcock*, no. 21,514 (TYPE, U. S., phot. and fragm. Gr.). Apparently related to *E. Hitchcockii* Robinson and similarly turning dark in drying but readily distinguished by its much narrower and thinner leaves, dark-fulvous tomentum on stems etc., its smoother, distinctly nerved phyllaries and much shorter pedicels.

E. (§ **Subimbricata-Eximbricata**) **chalceorithales**, spec. nov., fruticosum patenter oppositirameum griseo-tomentellum; caule et ramis gracilibus teretibus brunnescenti-griseis; internodiis plerisque 1–2 cm. longis; foliis (rameis) oppositis brevissime petiolatis in axillis non proliferis ovato-lanceolatis utroque angustatis apice obtusis vel acutiusculis basi acutis margine utroque latere 2–3-serrato-crenatis ima a basi 3-nervatis pallide viridibus subtus vix pallidioribus utrinque dense sed brevissime puberulo-tomentellis 1.4–2 cm. longis 6–10 mm. latis; petiolo 1–2 mm. longo; corymbis sessilibus terminalibus basi foliaceo-bracteatis numerosis 2.5–5 cm. diametro conjunctim paniculam subpyramidatam formantibus; capitulis ca. 9-floris 6–7 mm. altis; involucri turbinati squamis ca. 11 valde inaequalibus 3–4-seriatim gradatis sed paullo inter se imbricatis fulvescenti-griseis; intimis oblongo-linearibus obtusis ca. 3 mm. longis et 0.6 mm. latis 2–3-nervatis; intermediis brevioribus oblongo-lanceolatis vel lanceolato-linearibus etiam 2–3-nervatis; extimis angustissimis linearilanceolatis acutissimis laxis in bracteolas gradatim transientibus; corollis ca. 3.2 mm. longis; tubo proprio ca. 1.5 mm. longo granulifero in fauces paullo ampliatas gradatim transienti; achaeniis ca. 2.8 mm. longis in angulis minute ciliatis; pappi setis ca. 35 albidis corollam

subaequantibus.—CUBA: Province Oriente: in eruptive soil on dry hills in the Sierra del Cobre at Cobre, 6 Oct. 1916, *Ekman*, no. 7811 (TYPE, in Gray Herb.).

This species possesses much the habit and many of the characteristics of *E. sinuatum* Lam. and is doubtless closely related to it. However, *E. sinuatum* has relatively wider, much more obtuse leaves, which are prevailingly proliferous in the axils. Furthermore, their lobing or dentation, where present, tends to be more spreading. Moreover the outer phyllaries in *E. sinuatum* are ovate and obtuse or rounded, while they are lance-linear and acute in the plant here described.

E. (§ **Eximbricata**) **confluentis**, spec. nov., herbaceum verssimiliter perenne erectum griseo-tomentellum vel -puberulum 4 dm. vel ultra altitudine; caule tereti costulato fistuloso 6 mm. diametro apicem versus adscendenter ramoso; foliis oppositis graciliter petiolatis ovato-oblongis vel oblongo-lanceolatis acutis argute serratis (dentibus 0.5–2 mm. longis 2–4 mm. basi latis) supra crispe puberulis subtus pallidioribus griseo-tomentellis 4–8 cm. longis 1.5–4 cm. latis basi plerumque abrupte acutatis fere a basi obscure 3(–7)-nervatis deinde penniveniis, petiolo 1.5–2 cm. longo griseo-tomentello; corymbis in ramis terminalibus compactis valde convexis 2–2.5 cm. (juventate) diametro; pedicellis 2–3 mm. longis griseo-tomentellis non glandulosis; capitulis ca. 85-floris ca. 4 mm. altis et 6 mm. diametro; involucri subcampanulati squamis ca. 16 lanceolatis acuminatis subaequalibus vix imbricatis dorso griseo-pubescentibus ca. 4 mm. longis; corollis ut videtur albis sparse granulatis; tubo proprio 1.6 mm. longo; faucibus gradatim paullo ampliatis ca. 1.4 mm. longis; dentibus limbi patentibus deltoideis 0.4 mm. longis; achaeniis nigris sparse granulatis 1.3 mm. longis basi pallide callosis; pappi setis albis tenuissime capillaribus ca. 2.8 mm. longis.—*E. steviaefolium* Britton, Bull. Torr. Bot. Club, xviii. 334 (1891), not DC. *E. trichobasis* Robinson, Contrib. Gray Herb. n. s. lxi. 74 (1920) in part (as to plant of Rusby), not Bak.—BOLIVIA: junction of the Rivers Beni and Madre de Dios, Aug., 1886, *Dr. H. H. Rusby*, no. 1656 (TYPE, in Gray Herb., isotypes N. Y., K., U. S., Mo.).

The writer, when some years ago revising the Eupatoriums of Bolivia, doubtfully associated this plant with some material collected by Dr. Otto Kuntze, in the province of Santa Cruz and identified by Prof. Hieronymus as *E. trichobasis* Bak. Through the kindness of Prof. Diels, director of the Botanical Garden and Museum at Berlin-Dahlem, he has recently been able to obtain two photographs

and some fragments of the type material of *E. trichobasis* Bak., a species which proves, as suspected, to be quite a distinct plant, with larger heads, more velvety, purplish phyllaries, shorter leaves, and a glandular pubescence. Careful investigation of the Bolivian plant here described shows its receptacle nearly flat and essentially glabrous. The species is therefore referred to § *Eximbricata*, in which among the Bolivian representatives of that section it appears to have no very close relative.

Incidentally it may here be recorded that the original material of Sello representing Baker's *E. trichobasis* bears in the Botanical Museum of Berlin the number 4628 (duly labeled in hand of Baker), not 136 as, through some clerical error, entered in the Flora Brasiliensis, vi. pt. 2, 364 (1876). Re-examination of the specimen, collected by Dr. Kuntze in the Department of Santa Cruz, and once more kindly loaned to the writer from the herbarium of the New York Botanical Garden, shows it identical with Rusby's no. 1656, the plant here described as *E. confluentis*. *E. trichobasis* Bak. should, therefore, be dropped from the flora of Bolivia, being as yet known only from Brazil.

E. (§ **Subimbricata**) **dejectum**, spec. nov., ut videtur fruticulosum vel subherbaceum erectum 2–3 dm. altitudine; caule gracili tereti subvirgato folioso vel tardius foliis delapsis subnudo brunneo brevissime crispeque griseo-puberulo apicem versus patenter corymboso-ramoso; foliis alternis et subopppositis plerisque reflexis lanceolatis integerrimis attenuatis sed ad apicem verum obtusiusculis basi cuneato-attenuatis sessilibus vel breviter petiolatis; limbo 9–21 mm. longo 2–5 mm. lato margine revoluto a basi 3-nervato supra puberulo viridi subtus breviter pubescenti vix pallidiori, petiolo gracili vix 2 mm. longo; corymbi compositi 5–15 cm. diametro ramis alternis patenter adscendentibus foliosis; capitulis pedicellatis ca. 15-floris 12 mm. altis 7 mm. diametro; involucri anguste campanulati squamis 3–4-seriatim imbricatis acutiusculis dorso tenuissime tomentellis, extimis ovatis ca. 2 mm. longis, intermediis ovato-oblongis, intimis lanceolato-linearibus ca. 8 mm. longis; corollis ca. 7 mm. longis obscure puberulis, tubo proprio 3 mm. longo, faucibus gradatim dilatatis etiam ca. 3 mm. longis, dentibus limbi lanceolatis acutis 1.3 mm. longis; achaeniis gracilibus 5 mm. longis in faciebus granulatis, in angulis hispidulis; pappi setis ca. 30 subplumoso-barbellatis 6.5 mm. longis flavido-albis.—BOLIVIA or ARGENTINA: "Miraflor," *A. d'Orbigny*, no. 1331 (TYPE, Par., phot. and small fragm. Gr.).

On its label in the Museum of Natural History at Paris there seem originally to have been only the words "Herb. Mus. Paris"

(in print) and "Ab *D'Orbigny*" (in manuscript). To these there were added apparently at a later date and in different hand the determination "Bulbostylis" and the locality "Bolivie." However, on a separate slip (presumably a sort of field label) glued to the same sheet appears the further data "Miraflor No. 1331."

As no Miraflor or *hispanice* Miraflores has been found in Bolivia it seems probable that the Miraflor on D'Orbigny's field label referred to the place of that name in Northern Argentina.

E. dejectum (so named from its reflexed as it were pendant leaves) is most closely related to *E. patagonicum* Klatt and *E. patens* D. Don. It differs from both by its more numerous florets (about 15 in the head instead of 5–10), its entire leaves, very short petioles, narrow leaf-blade, subplumose rather than obscurely barbellate pappus-bristles, and the hispidity on the angles of the achenes. Unhappily the base of the plant is not shown in the material at hand, so it is not quite certain whether it is essentially herbaceous as it appears in the specimens or whether these are branches of a larger shrub. Their own radial rather than dorsiventral branching rather suggests an upright scarcely woody herb. In its involucre, pubescence and in many other respects *E. dejectum* approaches the Brazilian *E. Bakerianum* Robinson, Contrib. Gray Herb. lxxv. 5, (1925), but that has very much larger leaves, more paniculate inflorescence, fewer-flowered heads and a very different corolla, which is somewhat constricted just below the limb and which has teeth less than half as long as those of *E. dejectum*.

E. DECUMBENS (Gardn.) Bak. in Mart. Fl. Bras. vi. pt. 2, 344 (1876). Examination of the material now available of this species shows that it falls into two usually distinguishable though seemingly to some extent intergrading varieties, which may be defined as follows:

Var. **typicum**, caulibus solum basin versus vix per tertiam partem longitudinis foliatis supra in pedunculos saepius nudiusculos perlongos productis; foliis ovatis vel obovatis plerisque obtusis crenato-serratis.

Var. **stenum**, var. nov., caulibus basin versus magis ramosis et fere ad mediam partem foliatis et supra plerisque 3–5-capituliferis; foliis lanceolatis a media parte ad apicem utroque argutius 1–2-serrato-dentatis.—*E. polyanthum* Glaziou, Bull. Soc. Bot. Fr. lv. Mém. 3, 384 (1909), not Sch.-Bip.—BRAZIL: Campos da Bocaina, São Paulo, suffrutescent, flowers violet, Feb. 10, 1876, *Glaziou*, no. 8124 (Copenh., fragm. Gr.); open hills, Campo do Jordão, São Paulo, Apr. 23, 1922, *Prof. & Mrs. E. W. D. Holway*, no. 1762 (Gr.), in part; Campos do

Jordão, São Paulo, alt. about 1600 m., Feb. 12, 1924, *L. H. & E. Z. Bailey*, no. 830 (TYPE, in Gray Herb.). This plant, though characteristic, at times grows with the typical variety and has by two collectors been gathered with it. Especially Holway's no. 1762 suggests probable intergradation.

The author would place this species in § *Cylindrocephala* rather than § *Praxelis* where placed by Baker.

E. DIPLODICTYON Robinson, Proc. Am. Acad. liv. 242 (1918). This species was founded on a single specimen (in the Kew Herbarium) labelled as having been collected in Colombia by Lobb. Unfortunately the label gave no further data. Mr. E. P. Killip of the United States National Museum has recently informed me that from his studies of the Passifloras collected by Lobb and from an examination of specimens in the Kew Herbarium he had become convinced that some, if not all, of Lobb's specimens labelled as from Colombia came in reality from Peru. In connection with this matter and in confirmation of Mr. Killip's interesting theory, it may here be recorded that the characteristic *E. diplodictyon*, never rediscovered in Colombia, has lately been collected by Mr. J. F. Macbride in Central Peru, his label bearing the following data: "No. 4296. Liana with wistaria-color fls., about 8000 feet. Herbage pungent, June 5–7, 1923, Muña. Trail to Tambo de Vaca, Peru." Thus Peruvian material corresponds remarkably with the original plant of Lobb, now represented at the Gray Herbarium by two photostat copies (positive and negative). The occurrence of this plant in Peru and the failure of recent expeditions to discover any trace of it in Colombia adds new evidence in substantiation of Mr. Killip's ingenious theory.

E. (§ **Eximbricata**) **dispar**, spec. nov., annuum erectum patenter sordide articulato-villosum 5–6 dm. altum adscendenter ramosum; radice fibrosa; caule tereti basi paullo lignescenti fistuloso 4 mm. diametro; internodiis 5–60 mm. longis; pilis indumenti plerisque brevibus cum aliquibus multo longioribus attenuatis articulatis; foliis disparato-oppositis petiolatis deltoideo-ovatis acutis grosse crenato-serratis basi patenter cordatis supra viridibus puberulis et parce villosis subtus griseo-viridibus villoso-hirsutulis glandulari-atomiferis a basi trinervatis 1.5–3.2 cm. longis 1.2–2.6 cm. latis textura molliter membranaceis; petiolo 3–21 mm. longo puberulo et patenter villoso: corymbis terminalibus maturitate planiusculis; bracteolis parvis linearibus; pedicellis 3–7 mm. longis; capitulis ca. 19-floris 6 mm. altis 6–7 mm. diametro; involucri squamis ca. 10 subaequalibus oblongis obtusis vel subacutis eroso-ciliatis 2–3-costulatis viridibus

vel purpureo-tinctis dorso tomentellis ca. 4 mm. longis et 1.2 mm. latis; corollis albis 3 mm. longis extus praecipue in tubo proprio (1 mm. longo) et dentibus limbi (ca. 0.8 mm. longis) papilloso-scabratis; achaeniis nigris gracilibus basin versus attenuatis in angulis sursum hispidulis 2 mm. longis; pappi setis capillaribus albis ca. 2.7 mm. longis.—PERU: Department of Cuzco: annual herb on open rocky cliffs above river at "Pillahuata," Cerro de Cusilluyoc, alt. 2200–2400 m., May 3–6, 1925, *Pennell*, no. 13,967 (TYPE, in Gray Herb.).

This well marked species may be placed near *E. vallincola* DC., but differs in its annual nature, densely puberulent, as well as villous leaves, which are of smaller size and more deeply cordate, its broader, less numerous phyllaries, more copious pappus, etc. The name *dispar* is used in the sense of unpaired, and alludes to the members of the leaf-pairs, which are often separated by an interval of nearly 1 cm.

E. DOMBEYANUM DC. Prod. v. 167 (1836); Robinson, Proc. Am. Acad. lv. 11–12, 82 (1919). This species, described from material collected by Dombey, was in the original diagnosis recorded merely as from South America. Some years ago, when the writer (l. c.) was revising the Eupatoriums of Peru, he ventured to place provisionally *E. Dombeyanum* in his key and include it in the enumeration of species for that country. It is now possible to confirm its occurrence in Peru, for specimens from the Peruvian collection of Pavon, now in the Herbarium of the University of Geneva, prove to be identical with the De Candollean type, agreeing closely in all respects. Though most of Pavon's Peruvian material lacks precise data of collection this bears a label of some detail giving the habitat as "in Provinciae Chancay collibus altis nec dis ad Teguam et Huauram," in other words the coastal region north of Callao, which is in fact one of the parts of Peru visited by Dombey.

E. (§ **Eximbricata**) **Ekmanii**, spec. nov., ut videtur herbaceum perenne (basi ignota) 7 dm. vel ultra altum; caule tereti post exsiccationem multicostulato ca. 2.3 mm. diametro albo-medulloso atro-brunneo paullo purpurascenti breviter patenterque purpureo-pubescenti, capillis attenuatis moniliformibus; internodiis usque ad 1 dm. longis; foliis oppositis breviter petiolatis ovato-oblongis acutis vel acuminatis subintegris vel irregulariter undulato-dentatis (dentibus utroque 0–3 rotundatis 0.5–2 mm. altis inter se distantibus) basin versus integerrimis basi rotundatis supra viridibus sublucentibus papilloso-scabridulis minute prominulenter reticulatis subtus atroviolascentibus prominulenter reticulatis in nervis minute pubescentibus in superficie cum glandulis minutis sparsis lucentibus ornatis paullo

supra basin 3-nervatis 4.5–6.5 cm. longis 2–2.5 cm. latis firmius membranaceis; petiolo ca. 4 mm. longo atroviolaceo dense fusco-pubescenti; foliis superioribus multo minoribus bracteiformibus; panicula terminali laxissima ca. 2 dm. diametro; ramis gracilibus patenter adscendentibus; pedicellis usque ad 2.5 cm. longis cum bracteolis lineari-subulatis 2–3 mm. longis ornatis; capitulis ca. 11-floris 7 mm. longis; involucri squamis interioribus ca. 7 linearibus acutis subaequalibus 4.5–6 mm. longis atropurpureis minute fusco-hispidulis et cum glandulis globosis lucentibus ornatis; squamis exterioribus 3–5 multo brevioribus angustissimis; corollis tubulatis sursum paullo gradatim ampliatis (sine faucibus distinctis) ca. 3.5 mm. longis dense atomiferis verisimiliter atropurpureis; dentibus limbi brevissimis recurvatis; achaeniis 2.5 mm. longis deorsum attenuatis granulatis; pappi setis ca. 25 sublaevibus sordide albis ca. 3 mm. longis.— CUBA: Province Oriente: in pine wood on northern slope at El Yungue near Baracoa, 20 Nov. 1914, *Ekman*, no. 3552 (TYPE, in Bot. Mus. Berlin, phot. and fragm. Gr.).

This species stands probably nearest *E. incisum* Griseb. but differs conspicuously, in its lax inflorescence and sparingly undulate-dentate instead of sharply incised leaves which have on both surfaces an elevated reticulation.

E. HAVANENSE HBK. Nov. Gen. et Spec. iv. 128 (1820). This species, common in many parts of Cuba as well as in Mexico and southwestern United States, has a fair constancy in habit and floral characters. It shows, however, some fairly marked variations both in leaf-contour and in pubescence. These may be indicated as follows:

Var. **typicum**, inflorescentia saepius plus minusve puberula vel tomentella excepta glaberrimum; foliis basi rotundatis vel subtruncatis.—*E. havanense* HBK. l. c.

Var. **cardiomorphum**, var. nov., foliis basi distincte cordatis, aliter var. *typico* simile.—CUBA: Province Pinar del Rio; jurassic limestone rocks, Sierra de Viñales in Loma de la Bandera, 9 Mar., 1924, *Ekman*, no. 18,666 (TYPE, in Bot. Mus. Berl., phot. and fragm. Gr.). The available material of this rather striking variety is unfortunately overmature, the inflorescences are withered, and the involucres dried, recurved and empty. However, it seems sufficiently clear that it belongs to the species with which it is here associated, though exhibiting a leaf-form not previously recorded.

Var. **pubinerve**, var. nov., foliis (leviter crenatis vel obtuse serratis) supra parce pulverulento-puberulis subtus secus nervis patenter

pubescentibus et in superficie parce pubentibus; axibus juvenilibus et petiolis puberulis vel etiam tomentellis.—CUBA: without indicated locality, *Wright*, no. 3598 (Gr.); open places in shrubby thickets on north slope of Pico Turquino, about 1700 m. alt., Sierra Maestre, *Ekman*, no. 5416 (TYPE, in herb. Bot. Mus. Berlin, fragm. Gr.); and in the same range on top of Punta de Palmamocha, south of Yara, alt. 1400 m., 15 July, 1922, *Ekman*, no. 14,302 (Brl., fragm. Gr.). In Ekman's specimens of this plant the leaves are all rather small rameal ones, but Wright's no. 3598 shows fully developed cauline leaves with precisely similar pubescence. Var. *pubinerve* as to pubescence resembles the plant described long ago from Texas as *E. ageratifolium* β. *texense* Torr. & Gray, Fl. ii. 90 (1841), but later completely reduced by Gray, Syn. Fl. i. pt. 2, 100 (1884). However, the Texan form has larger, more acute, and much more deeply toothed leaves than the Cuban plant here described, in which the leaves are obtusish to rounded at tip, rounded at the sides, and very shallowly crenate-dentate. The species runs into several other more or less distinguishable local forms or varieties but their differences are of trifling nature and by no means constant.

E. (§ **Eximbricata**) **helianthemoides**, spec. nov., fruticosum ramosum crispe puberulum vel brevissime griseo-tomentellum; ramis patenter adscendentibus gracilibus foliosis; internodiis 3–20 mm. longis; foliis oppositis brevissime petiolatis oblongo-linearibus vel anguste lanceolatis obtusis integris basi rotundatis utrinque griseo-pulverulentis vel subtus brevissime puberulis basi breviter 3-nervatis aliter penniveniis firmiter membranaceis 2–3 cm. longis 4-6 mm. latis; petiolo 1–2 mm. longo; corymbis ad apices ramorum sessilibus plerumque 4–12-capitulatis planiusculis 2–4 cm. diametro; pedicellis 4–13 mm. longis; capitulis ca. 15-floris 6–7 mm. altis; involucri squamis ca. 14 lanceolato-linearibus attenuatis granulatis, interioribus subaequalibus ca. 4.5 mm. longis, exterioribus 3–4 minoribus angustis; corollis ut videtur pallidis 3.5 mm. longis cum glandulis sphaericis adsparsis; tubo proprio ca. 2 mm. longo; faucibus turbinatis ca. 1.5 mm. longis; dentibus limbi deltoideis ca. 0.6 mm. longis; achaeniis nigris granulatis 2.3 mm. longis basi breviter attenuatis et pallide callosis; pappi setis 25–30 albidis tenuibus laeviusculis ca. 2.7 mm. longis.—CUBA: Province Oriente; hillside, Santiago Harbor, 14–15 Mar., 1909, *N. L. Britton*, no. 1890 (Gr.); steep bank, Santiago Bay, 10–25 Mar., 1912, *N. L. & E. G. Britton & J. F. Cowell*, no. 12,697 (Gr.); on bank of river Aguadores; Santiago, June 14, 1918, *Ekman*, no. 9228 (Gr.); vicinity of Santiago Bay, July, 1920, *Bro. Clement*, no. 288 (TYPE, in Gray Herb.).

This plant has much the habit of *E. Lindenianum* A. Rich. and the specimens earlier examined were doubtfully referred to that species. However, the amount of material now at hand shows consistent and ample differences for its separation. In *E. Lindenianum* the leaves are larger, more ovate-lanceolate, attenuate, decidedly discolorous, and grayish-tomentellous beneath, while the phyllaries are but 2–2.5 mm. in length, oval and obtuse. Both species appear to be common about Santiago.

E. (§ **Subimbricata**) **holguinense**, spec. nov., fruticosum ad 1.5 m. altum oppositirameum brevissime denseque pannoso-lanulatum; caulibus teretibus tardius glabratis post exsiccationem levissime costulatis 3–4 mm. diametro albo-medullosis; internodiis 2–8 cm. longis; ramis patenter adscendentibus; foliis oppositis lanceolatis vel ovato-lanceolatis vel rarius suboblongis gradatim acuminatis vel rarius obtusis integerrimis vel repando-denticulatis basi rotundatis fere a basi 3(–5)-nervatis supra primo griseo-puberulis mox glabrescentibus bullatissimis griseo-viridibus et lucidis subtus primo breviter albo-tomentellis tardius griseo-albidis prominulenti-reticulatis 2.5–5 (–8.3) cm. longis 6–20(–38) mm. latis subcoriaceis; petiolo brevissime albido-tomentello 3–5 mm. longo; corymbis compositis planiusculis; capitulis subglomeratis breviter pedicellatis ca. 16–20-floris ca. 7 mm. altis; involucri squamis 3–4-seriatim imbricatis lanceolatis vel oblongis appressis dorso griseo-pubescentibus 2–3-nervatis et cum glandulis globosis aureis sparsis ornatis; exterioribus acutis, interioribus subobtusis; corollis (verisimiliter albis vel pallidis) tubulatis vix sursum ampliatis 3.2 mm. longis usque ad mediam partem cum glandulis sessilibus globosis adspersis supra glaberrimis; achaeniis juvenilibus 2.2 mm. longis deorsum paullo decrescentibus in angulis paullo scabratis; pappi setis ca. 25 vix barbellato-scabratis ca. 3 mm. longis sordide albis,—CUBA: Province Oriente, on slopes of the Cerro de Fraile, about 275 m. alt., near Holguin, 29 Oct., 1914, *Ekman*, no. 3271 (TYPE, in Gray Herb.); not rare in pine-savannas on the Sierra de Nipe near the Rio Piloto, 1 Sept., 1914, *Ekman*, no. 2697 (Gr.); in stony pine woods near the Rio Piedra on the Sierra de Nipe, 3–4 July, 1914, *Ekman*, no. 1810 (Brl., fragm. Gr.).

Earlier and not wholly satisfactory specimens of this plant were collected in the same region by the late J. A. Shafer, namely his numbers 1219 (from the top of Loma Pilon), 1238 (by water course on barren savannas, southeast of Holguin), 1753 (shrubby, 1.5 m. high, flowers white, lower hills near Pinales), and 3307 (in thickets, on serpentine formation, along trail from Puedra Gorda to Woodfred,

in the Sierra Nipe). These specimens were at the time doubtfully referred by the writer to *E. lantanifolium* Griseb., which, however, has cordate-ovate much more obtuse leaves, tawny beneath, as well as much more acute and less distinctly nerved phyllaries.

E. holguinense, as now judged from much more complete material, can be seen to approach more nearly *E. hypoleucum* Griseb., but that has more broadly ovate and more decidedly toothed leaves, which even at full maturity are dull, not lucid above. It also has more numerous florets, 30–40 in a head.

E. HUMILE (Benth.) Hieron. ex Therese, Princess of Bavaria, Beihefte Bot. Centralbl. xiii. 68 (1902); Robinson, Proc. Am. Acad. liv. 322. (1918). *Conoclinium humile* Benth. Pl. Hartw. 199 (1845). The original transfer of this species from *Conoclinium* to *Eupatorium*, at the point indicated, though made in 1902, was unfortunately recorded so obscurely as to type or other indication of a new combination of names as to escape completely the notice of the expert indexers employed both on the supplements of the Index Kewensis and of those engaged in carrying forward the Card Index of New Genera, Species, and Varieties of American Plants. In consequence its existence was unknown to the writer, when some years ago preparing a revision of the Eupatoriums of Colombia. Accordingly, attention may be here called to the fact that the correct authority for the name in question is (Benth.) Hieron.

E. (§ **Subimbricata**) **hygrohylaeum,** spec. nov., herbaceum perenne erectum 3 dm. vel ultra altum; caule tereti obscure tomentello 4 mm. vel ultra diametro albo-medulloso; internodiis usque ad 8 cm. longis; foliis oppositis petiolatis ovatis acuminatis serratis basi rotundatis pinnatim ca. 11-nervatis utrinque laete viridibus supra glabris subtus vix pallidioribus in nervis venisque puberulis inter nervis prominulenter reticulatis ca. 8 cm. longis et 5 cm. latis; petiolis ca. 1.4 cm. longis puberulis; corymbo terminali planiusculo ca. 3 dm. diametro; bracteis bracteolisque linearibus parvis vel minutis; pedicellis filiformibus 2–9 mm. longis; capitulis ca. 30-floris 7 mm. altis 6 mm. diametro; involucri squamis ca. 36 pulcherrime imbricatis ca. 4-seriatis apice rotundatis dorso viridibus albo-striatis puberulis margine lacerato-ciliolatis, exterioribus ovatis, interioribus ovato-oblongis vel linearibus; receptaculo leviter convexo; corollis albis glabris 3 mm. longis tubulatis sursum paullo ampliatis sine faucibus distinctis; dentibus limbi ca. 0.5 mm. longis; achaeniis maturitate nigris 1.5 mm. longis in angulis pallidis parcissime hirtellis vel glabris in faciebus praesertim apicem versus paullo granulatis; pappi setis

ca. 35 albis sublaevibus ca. 2.7 mm. longis.—COSTA RICA: Province San José: wet forest, erect herb; flowers dirty white, La Hondura, alt. 1200–1500 m., Mar. 9, 1926, *Standley & Valerio*, no. 51,933 (TYPE, in U. S. Nat. Herb., phot. and fragm. Gr.).

This species may be readily recognized among the Costa Rican members of the genus by its very numerous involucral scales which are rounded at the tip, dorsally striped, and lacerate-ciliolate on the edge. The involucre, though of smaller size recalls those of some of the Colombian and Ecuadorian members of § *Hebeclinium*, but the receptacle is here glabrous.

E. (§ **Eximbricata**) **juninense**, spec. nov., fruticosum scandens (?) fulvido-tomentellum; caule tereti usque ad 8 mm. diametro tardius glabrato griseo multicostulato fistuloso; internodiis 3–14 cm. longis; foliis oppositis petiolatis oblongis utroque acuminatis minute cuspidato-denticulatis (dentibus ca. 0.3 mm. altis et 5 mm. inter se distantibus) primo aspectu integris supra puberulis post exsiccationem brunneo-olivaceis subtus pallidioribus fulvescenti-velutinis penniveniis 7–12 cm. longis 4–6 cm. latis membranaceis; petiolis 8–15 mm. longis; corymbis terminalibus patenter trichotomis convexis ca. 8 cm. diametro; bracteolis subulatis; pedicellis plerisque 2–5 mm. longis; capitulis ca. 33-floris 6.5 mm. altis 6 mm. diametro; involucri squamis ca. 17 lanceolatis attenuatis dorso brunnescenti-pubescentibus 3-nervatis, exterioribus paucis gradatim minoribus, interioribus subaequalibis vix imbricatis, ca. 5 mm. longis et 1.2 mm. latis, intimis 2–3 oblanceolato-linearibus laeviusculis; receptaculo plano paullo alveolato glabro; corollis albidis viridescentibus tubulatis 4 mm. longis glabris sine faucibus distinctis; dentibus limbi anguste deltoideis reflexis; achaeniis nigrescentibus 2 mm. longis glabris; pappi setis ca. 25 sordide albis 3.8 mm. longis sublaevibus sursum non incrassatis.—PERU: Dept. Junin: on tree; flowers whitish, turning greenish, La Merced, about 610 m. alt., Aug. 10–24, 1923, *J. Francis Macbride*, no. 5583 (TYPE, in Field Mus., isotype Gr.).

This species has foliage similar to that of the Mexican *E. miradorense* Hieron., which, however, has quite different, very pubescent corollas and other technical distinctions. *E. juninense* is, as to its involucre, somewhat intermediate between § § *Eximbricata* and *Subimbricata*, but seems better referred to the former, since its fairly uniform inner phyllaries are little imbricated, though a few of the outer ones are graduated.

Among the previously described Eupatoriums of Peru this is related perhaps most nearly to *E. endytum* Robinson, a species

similarly transitional between §§ *Subimbricata* and *Eximbricata*, but showing slightly greater approach to § *Subimbricata*. *E. endytum* has leaves usually rounded at base, longer petioles, a leafy-bracted inflorescence, and elliptic-lanceolate phyllaries. Perhaps the best difference is to be found in the indument, which in *E. endytum* is on the lower surface of the leaf-costa and nerves compactly woolly-crisped and of a rusty color, while in *E. juninense* the hairs are straight, setuliform and of a khaki color with no ferruginous tinge.

E. (§ **Subimbricata**) **Killipii** spec. nov., fruticosum ramosum; caule tereti griseo obscure costulato 4 mm. vel ultra diametro; foliis oppositis petiolatis ovatis crenato-serratis acuminatis sed ad apicem verum obtusis basin rotundatam vel patenter cordatam versus integriusculis firmiter membranaceis utrinque viridibus a basi 5-nervatis in nervis puberulis aliter glabris leviter reticulatis minute crebreque pellucido-punctatis 4.5–8 cm. longis 3–4.5 cm. latis; petiolo 5–10 mm. longo sordide tomentello, paniculis terminalibus divaricatim ramosis ca. 5 cm. altis et 10 cm. diametro rotundatis brunneo-puberulis; ramis ramulisque paniculae gracilibus; bracteis parvis; bracteolis minutis subulatis; capitulis graciliter pedicellatis vel plerisque ad apices ramulorum binis vel trinis et arcte sessilibus ca. 21-floris ca. 4 mm. longis et 2.5 mm. diametro; involucri campanulati bene imbricati et gradati squamis pluriseriatis obtusis viridibus pulcherrime 3–5-nervatis, exterioribus ovatis interioribus lanceolato-oblongis ciliolatis; corollis albis 2.5 mm. longis (immaturis) graciliter tubulatis sine faucibus distinctis; achaeniis (valde immaturis) 0.7 mm. longis; pappi setis ca. 35 corollam aequantibus albis,—COLOMBIA: Department of El Valle: forest in Dagua Valley, Cisneros, alt. 300 to 500 m., 21 Sep., 1922, *Ellsworth P. Killip*, no. 11,488 (TYPE, in Gray Herb.).

This neat shrub in many respects resembles the still obscure *E. smilacinum* HBK. but that was described by Kunth as a twining herb with sulcate, angled stems and hispid leaves. In *E. smilacinum* (as shown by a photograph of the type), the heads are more densely clustered in globular glomerules; furthermore the more coarsely crenate-serrate leaf-blade is obtuse at base rather than rounded or subcordate as in *E. Killipii;* finally the leaf-blade in the former is about 4–5 times as long as the petiole, while in the latter it is 8–9 times as long. Both species in their involucral characters form a transition between §§ *Cylindrocephala* and *Subimbricata*.

E. (§ **Cylindrocephala**) **laevigatulum**, spec. nov., herbaceum vel suffruticosum patenter oppositi-ramosum ubique laeviusculum

primo aspectu glaberrimum sed obscure praesertim in partibus juvenilibus puberulum 5–10 dm. altum ad inflorescentiam foliatum; caule subtereti post exsiccationem pluricostulato erecto glabro vel apicem versus minute nigro-puberulo; foliis oppositis graciliter petiolatis ovato-lanceolatis plerisque integerrimis rariter uno vel altero latere 1(–3)-dentatis ad apicem longe attenuatis basi cuneatis 4–7.5 cm. longis 7–20 mm. latis paullo supra basin 3-nervatis membranaceis utrinque glabris vel obscure puberulis; petiolo 5–15 mm. longo; corymbis terminalibus planis compositis laxis; corymbulis subdensis plerisque 5–10-capitulatis; capitulis 7–13-floris 11 mm. longis 5 mm. diametro saepe juventate in pedicello curvato nutantibus; involucri squamis ca. 15–19 substramineis plerisque 5-nervatis obtusis obscure ciliatis deciduis dorso glabris; extimis ovatis 1.6 mm. longis 1 mm. latis, intermediis 3 mm. longis 1.4 mm. latis, intimis paullo acutioribus ca. 5.5 mm. longis 0.7 mm. latis; corolla glabra ca. 5 mm. longa lilacino-caerulea, tubo proprio sursum gradatim paullo ampliato, faucibus distinctis nullis, dentibus limbi brevissimis ca. 0.3 mm. longis; achaeniis gracilibus atrobrunneis deorsum decrescentibus 4 mm. longis in costis breviter sursum hispidulis basi breviter pallido-calcaratis in summa parte cum annulo pallido pappifero coronatis; pappi setis 32–39 flavido-albis scabratis corollam subaequantibus.—*E. graciliflorum* Chod. Bull. Herb. Boiss. ser. 2, ii. (146) 306 (1902), iii. (133) 705 (1903), not DC. *E. Orbignyanum* Hassl. in Fedde, Rep. Spec. Nov. xiv. 279 (1916), not Klatt.—ARGENTINE REPUBLIC: Corpus in Misiones, 1826, *Bonpland*, (Par., phot. and fragm. Gr.). PARAGUAY: without locality *Dr. Edward Palmer*, while on the Page Expedition for the exploration of the River La Plata, during the years 1853–56 (U. S.); on the banks of Lake Ypacari, 1898–99, *Dr. E. Hassler*, no. 3936 (Gr., Univ. Geneva); in swamp near Paraguari, Dec., 1900, *Dr. E. Hassler*, no. 6537 (Univ. Geneva); Santa Elisa in Gran Chaco, lat. S. 23° 10′, Mar. 1903, *Rojas*, no. 2817 (Gr., Univ. Geneva); in the region of Lake Ypacari, Mar., 1913, *Dr. E. Hassler*, no. 11,584 (TYPE, Gr., isotype, Copenh.); in woods near Salado, *Chodat*, no. 393 (Univ. Geneva); Puerto San Pedro, *Chodat*, no. 397 (Univ. Geneva).

For some years this plant has been known to the writer from fairly good specimens but all efforts to place it satisfactorily in any described species have failed. It is distinctly more slender, more smooth and more entire-leaved than any form of *E. odoratum* L. As Dr. Hassler rightly observed it fails to agree with De Candolle's *E. graciliflorum* to which it was first referred by Prof. Chodat. However, it is equally

unsatisfactorily placed as by Hassler in *E. Orbignyanum* Klatt, for a fragment of the type of that species contained in the herbarium of the late Dr. Klatt—a collection purchased by the Gray Herbarium —shows that *E. Orbignyanum* had a more rounded inflorescence, distinctly more acute inner phyllaries, and smaller leaves which are conspicuously glandular punctate. As several specimens have now accumulated, collected at different points in Paraguay and northeastern Argentina at divers times extending over almost a century and as they cannot be convincingly placed in any species hitherto described it seems best to put them on record as constituting a new species even though belonging to a very perplexing group.

E. LAEVIGATUM Lam. Encycl. ii. 408 (1788). This characteristic species widely distributed in the warmer parts of America is for the most part entirely glabrous and is apt to be so described without qualification. The first intimation that it might at times have pubescent forms seems to be found in Baker's var. *tomentosum*, published (as *tomentosa*) in Mart. Fl. Bras. vi. pt. 2, 287 (1876) a gray-velvety plant collected in Minas Geraes. In looking over an excellent representation of *E. laevigatum* recently lent me from the Botanical Museum of Copenhagen, I find several sheets of material (all collected in Minas Geraes though at different places and dates) which, being sparingly but definitely hairy, can by no means be placed either with the typical, wholly glabrous plant or satisfactorily in Baker's much more hairy, indeed gray-tomentose variety. To provide a definite place for these, the following may be put on record:

E. LAEVIGATUM, forma **subcapillatum**, forma nov., habitu formae typicae simile et similiter variabile, differt inflorescentia et caule (sursum) et petiolis et nervis venisque in pagina inferiori foliorum omnibus parce vel subdense hirtis.—BRAZIL: Caldas, Minas Geraes, *A. F. Regnell*, no. III. 685 (TYPE, in Bot. Mus. Copenh., phot. and fragm. Gr.); Facenda Mocambo, April, *Warming*, no. 494 (Copenh., fragm. Gr.); Lagoa Santa, *Warming*, no. 491 (Copenh.); a plant of the plains, common, Sitio, *Schenck*, no. 3176 (Copenh.).

E. LAXUM Gardn. in Hook. Lond. Jour. Bot. v. 476 (1846). When treating *Eupatorium* in the Flora Brasiliensis, vi. pt. 2, 307 (1876) Baker reduced Gardner's *E. laxum* to a variety of the then very broadly interpreted *E. guadalupense* Spreng. It has since become clear that this disposition will hold neither on classificatory nor nomenclatorial grounds. *E. guadalupense* Spreng. has been definitely shown by Urban, Symb. Ant. iv. 625 (1911) to have been nothing more nor less than *Pluchea purpurascens* (Sw.) DC. Nor can this lax-

panicled plant of eastern Brazil be satisfactorily placed varietally as by Baker, l. c., in the species then interpreted as "*E. guadelupense*" and now more properly called *E. microstemon* Cass. which has slightly smaller heads, narrower and thinner phyllaries, a smaller and more tubular corolla without very definite throat and with a glabrous limb. From the nearly related *E. pycnocephalum* Less., *E. laxum* Gardn. also differs clearly. Its inflorescence is much looser, its branches more slender, involucre less closely imbricated, and outer phyllaries more acute. It is true, no one of these features yields an entirely satisfactory differential trait, but they and various other minor characters are sufficiently definite to justify keeping the Brazilian *E. laxum* out of the chiefly cordilleran *E. pycnocephalum* which ranges from Mexico to Venezuela and Peru.

To the writer it does not seem worth while to separate the plants placed by Baker in his *E. guadalupense*, vars. *laxa* and *Gardneri* Even in Regnell's no. I. 232, cited by Baker as of his var. *laxum*, some of the leaves are quite markedly cordate, while the indument is exactly similar in kind to the pubescence of his var. *Gardneri* and very nearly as dense. The two varieties seem to be at best mere forms or chance combinations of characteristics which are subject to independent variation.

Very closely related is the earlier *E. remotifolium* DC. Prodr. v. 165 (1836) placed by Baker quite unaccountably in the synonymy of *E. vitalbae* DC. to which it has no likeness whatever. Vauthier's no. 259, the type of *E. remotifolium* has exceptionally long internodes, much surpassing the leaves, but this seems likely to have been merely a causal state for otherwise identical material collected for instance in Minas Geraes by Widgren (Copenh.) and in mountain woods at Petropolis by Ball (Gr.) have internodes considerably shorter, while preserving all the other traits of DeCandolle's species.

E. (§ **Eximbricata**) **lobuliferum**, spec. nov., ut videtur herbaceum perenne multicaule 6–9 dm. altum puberulum; caulibus erectis teretibus atropurpureis post exsiccationem paullo costulatis ca. 4 mm. diametro albo-medullosis; internodiis 8–11 cm. longis; foliis oppositis petiolatis late ovatis acuminatis multilobulatis basi patenter cordatis ima a basi 5-nervatis supra viridibus parce puberulis subtus paullo pallidioribus minutim fusco-reticulatis in nervis venisque hirtellis membranaceis 6–8 cm. longis 5–6 cm. latis; lobulis utroque latere 6–9 saepius in margine posteriori 1-dentatis paullo prorsum curvatis 4–9 mm. longis et latis obtusis vel acutiusculis; corymbis in caule ramisque terminalibus planiusculis subdensis multicapitulatis 4–8 cm.

diametro conjunctim inflorescentiam compositam foliaceo-bracteatam usque ad 2 dm. diametro formantibus; pedicellis filiformibus fulvo-puberulis 3–7 mm. longis cum bracteolis 1–3 lineari-subulatis ornatis; capitulis maturitate 1 cm. altis et 1 cm. diametro ca. 50-floris; involucri campanulati squamis lanceolato-linearibus ca. 17 stramineo-viridibus attenuatis dorso hirtellis; receptaculo plano nudo; corollis gracilibus limbum versus paullo hirtellis aliter glabris; tubo proprio 2 mm. longo; faucibus cylindratis 3 mm. longis; dentibus limbi lanceolatis acutis valde patentibus vel reflexis ca. 1 mm. longis et 0.5 mm. latis; achaeniis maturitate nigrescentibus sursum in faciebus et praecipue in angulis hispidulis ca. 2.6 mm. longis; pappi setis ca. 15 delicatule capillaribus albis 4–4.8 mm. longis.—PERU: Department of Lima: in clumps 6–9 dm. high on rocky eastern slope; flowers white, Matucana, alt. 2440 m., Apr. 12–May 3, 1922, *Macbride & Featherstone*, no. 481 (TYPE, Field Mus., isotype Gr.).

This species is in its more significant characters very close to *E. Sternbergianum* DC., but differs in having more numerously flowered heads of somewhat larger size and larger leaves which are distinctly cordate at base and conspicuously lobulate at the sides.

E. (§ **Subimbricata**) **nipense**, spec. nov. fruticosum oppositi-rameum; caulibus subteretibus brunneo-griseis quasi granulatis post exsiccationem pluricostulatis 3–4 mm. diametro albo-medullosis; internodiis 2–6.5 cm. longis; ramis gracilibus curvato-adscendentibus foliosis; foliis oppositis breviter petiolatis lanceolato-oblongis gradatim acutatis vel acuminatis subremote serrulatis basi rotundatis paullo supra basin pinnatim 3–5-nervatis supra laete viridibus glaberrimis sed cum globulis lucidis adspersis et minute prominulenter reticulatis rugosis et bullatis subtus etiam exserto-reticulatis griseo-puberulis (pilis brevibus valde curvatis albis vel singularibus vel aggregatis) quasi maculatis vel lepidotis plerisque 6–10 cm. longis 1.7–3 cm. latis; petiolo tereti ca. 5 mm. longo dense griseo-puberulo vel -tomentello; corymbis ramos et caulem terminantibus concavis (ramulis lateralibus axem principem superantibus) ca. 5 cm. diametro; pedicellis 0–6 mm. longis; capitulis ca. 7 mm. altis ca. 10–12-floris; involucri companulati 3–3.5 mm. longi squamis subtriseriatim imbricatis ovatis acutis vel interioribus obtusiusculis griseo-tomentellis obscure nervatis; corollis ca. 2.7 mm. longis tubulatis vix sursum ampliatis praecipue in media parte cum glandulis subsessilibus adspersis; achaeniis 2–2.2 mm. longis plerumque curvatis basin versus attenuatis atrogriseis in costis sursum breviter ciliatis et in superficiebus subpuberulis; pappi setis ca. 35 albidis minute scabratis corollam subaequantibus.—CUBA:

Province Oriente: near Bayate in the valley of the Rio Bayate, Sierra de Nipe, 13 July, 1914, *Ekman*, no. 1976 (Brl., fragm. Gr.).

This plant is clearly related to the somewhat variable *E. plucheoides* Griseb. but has much smaller, fewer-flowered heads, more obtuse phyllaries and quite a different pubescence. In *E. plucheoides* the upper surface of the leaves is at first appressed-villous. In the present plant it has scattered subsessile globose glands but is otherwise free from pubescence. The stem furthermore has a very short pubescence of curled hairs, while in *E. plucheoides* it is very densely appressed villous-tomentose especially about the nodes.

In some points the present plant agrees with the description of the still obscure *E. libanoticum* Sch.-Bip., but as Schultz states that that has 55-flowered heads and obtuse leaves about 2 inches by 1 inch of ovate form, it seems quite impossible that the two should prove conspecific.

E. (§ **Cylindrocephala**) **odoratum** L., var. **mallotophyllum**, var. nov., differt a var. typico praecique foliis brevioribus plerisque 2.5–3.5 cm. longis utrique dense griseo-tomentosis.—COLOMBIA: Caqueza, Dept. Cundinamarca, 1700 m., Jan. 1856, *Triana*, no. 1202 (TYPE, Par., fragm. Gr.); Gachetá, Dept. Quesada, *Triana*, no. 1203 (Par., fragm. Gr.).

So great has been the confusion both in the classification and the nomenclature of this species that a new variety is here recorded with some hesitation. However, even after many related species have been segregated (largely through the efforts of the late Prof. Hieronymus) there is still left in *E. odoratum* material of considerable diversity not as yet distinguished by varietal names. Thus the velvety plant here characterized certainly merits some separate designation from the often nearly smooth forms of this common and widely distributed species.

Triana's two specimens, 1202 and 1203, are not precisely identical, though their differences may well be merely ecological resulting from response to different degrees of exposure or due in part perhaps to different stages of maturity. In 1202 the phyllaries are shorter, more stramineo-scarious, paler, and tend to be more obtuse. In his 1203 they are darker, firmer in texture, longer, narrower, and at least the inner more acute. In foliage these two forms appear entirely alike and their involucral differences are no greater than those found elsewhere in the species.

E. PENNELLII Robinson, Proc. Am. Acad. liv. 254 (1918). The type material of this species, collected by Rusby & Pennell at the

foot of the Cordillera Oriental, near Neiva, Dept. Huila, Colombia, had as stated in the original description leaves which were subglabrous beneath. A very similar plant, collected in a hillside field at Salento, Dept. Caldas, in the Cordillera Central, alt. 1800–2100 m., by *Pennell, Killip & Hazen*, no. 8751 (Gr.), has the leaves very definitely hairy on the veins and nerves beneath. In all other respects the plants appear so closely similar that it seems best to regard them as conspecific variations of minor importance. The extension of the range to the Cordillera Central is of interest in a species previously observed only in the Cordillera Oriental and is, therefore, here put on record.

E. (§ **Eximbricata**) **petrophilum**, spec. nov., herbaceum annuum erectum ca. 5 dm. altum fere a basi ramosum molliter villosum; radice principi subsimplici deorsum decrescenti, secundariis paucis fibrosis; caule tereti brunnescenti multicostulato ca. 4 mm. diametro; internodiis plerisque 1.5–3 cm. longis; ramis gracilibus oppositis adscendentibus plerumque simplicibus; foliis ovatis vel ovato-rhombeis acutis incise crenato-serratis basin versus integris et cuneatis 3-nerviis concoloribus supra adpresse villosulis subtus longe et laxe villoso-pubescentibus textura teneris 2.5–4 cm. longis 1–2.5 cm. latis; petiolis 5–9 mm. longis sursum alatis; corymbis caulem et ramos terminantibus pluribus primo densis subglobosis ad maturitatem laxioribus et planiusculis; capitulis pedicellatis ca. 23-floris; ca. 6–8 mm. longis; involucri companulati squamis ca. 15 obovatis vel oblanceolatis obtusissimis vel apice rotundatis longitudine subaequalibus extus dense villosis margine lacerato-ciliatis, maximis (immaturis) 5 mm. longis et 2.2 mm. latis; receptaculo parvo planiusculo; corollis glabris ca. 4 mm. longis; tubo proprio gracili 1 mm. longo, faucibus cylindratis paullo ampliatis ca. 1.5 mm. longis; dentibus limbi deltoideis 0.5 mm. longis; achaeniis (valde immaturis) ca. 1.5 mm. longis cum glandulis globosis rubris ornatis; pappi setis ca. 30 albis capillaribus laevibus corollam subaequantibus; antheris apice distincte appendiculatis.—*E. steviaefolium*: Glaziou, Bull. Soc. Bot. Fr. lv. Mém. 3, 386 (1909), in part, not DC.—BRAZIL: Itatiaia, among rocks on the campo, Rio Janeiro, *Dr. A. Glaziou*, no. 6572 (TYPE, Bot. Mus. Copenhagen, fragm. Gr.).

This plant differs from *E. steviaefolium* DC. in having rhombic-ovate leaves (becoming 2.5 cm. wide) instead of lanceolate leaves (at most 1 cm. wide).

Its petioles (somewhat winged toward the summit) are 5–9 mm. long, while in *E. steviaefolium* they are exceedingly short (1–3 mm. in length). The leaf-blade is much more deeply and incisely crenate-

serrate than in *E. steviaefolium* and the achenes much more densely beset with red glands. In other respects it appears closely similar, except that it is clearly an annual, while *E. steviaefolium* is certainly at least sometimes a perennial herb if not a shrub.

Unfortunately Glaziou's no. 6572 is very immature. It is possible that better developed specimens will disclose other differential traits. At all events this plant cannot be satisfactorily left in *E. steviaefolium* DC., the only question being whether it is best treated as a broad-leaved variety or as a distinct species. In the absence of any intermediates the latter course seems the more appropriate.

E. (§ **Subimbricata**) **pithecobium,** spec. nov., fruticosum epiphyticum ab arboribus dependens obscure crispeque puberulum; caulibus 12–15 dm. longis crassis curvatis solum apicem versus foliiferis mox delapsu foliorum denudatis et cortice pallide grisea obtectis alternirameis vel dichotomis; foliis oppositis vel alternis petiolatis oblongis vel oblongo-lanceolatis gradatim acuminatis argute serrato-dentatis (dentibus utroque latere 5–8 ca. 0.5–2 mm. altis et 1–1.5 cm. inter se distantibus) basi cuneatis penniveniis utrinque viridibus puncticulatis subtus praecipue in costa hirtellis 5–12 cm. longis 2–5 cm. latis ut videtur textura subcarnosis; petiolis 1–1.5 cm. longis gracilibus; corymbis terminalibus ca. 12-capitulatis folia subtendentia subaequantibus; pedicellis filiformibus saepe rectis 1–1.5 cm. longis; capitulis ca. 22-floris ca. 11 mm. longis et 8 mm. crassis; involucri campanulati squamis ca. 18 hirtellis 3–4-seriatim imbricatis, extimis lanceolatis attenuatis ca. 3.5–5 mm. longis et 1–1.5 mm. latis, intermediis oblongis apice acutis vel obtusis vel rotundatis et laete roseis ca. 6 mm. longis et 1.7 mm. latis, intimis 1–3 spatulatis angustis; corollis roseis 6 mm. longis glabris a basi ad limbum gradatim ampliatis sine faucibus distinctis; dentibus limbi ovatis obtusis ca. 0.6 mm. longis; achaeniis ca. 3 mm. longis in angulis minute scabratis; pappi setis ca. 40 albis capillaribus ad apicem non incrassatis.—Costa Rica: Province of San José: a shrub pendent from tree in dense wet forest, flowers pale pink, Laguna de la Chonta, northeast of Santa Maria de Dota, alt. 2000–2100 m., Dec. 18, 1925, *Standley*, no. 42,181 (type, in Gray Herb.); near Finca La Cima, above Los Lotes, north of El Copey, alt. 2100–2400 m., Dec. 21–22, 1925, *Standley*, no. 42,727 (Gr.).

A species remarkable from its epiphytic habit, a trait which it shares with *E. araliaefolium* Less., *E. eximium* Robinson, and probably *E. carnosulum* Kuntze, *E. arthrodes* Robinson and *E. sciaphilum* Robinson.

E. (§ **Eximbricata**) **piurae**, spec. nov., fruticosum adscendenter ramosum brunneo-tomentellum; caulibus subteretibus; ramis saepe

subfastigiatis primo foliosis tardius basin versus delapsu foliorum denudatis nodulosis; internodiis 7–10 mm. longis; nodis subarticulatis; foliis oppositis elliptico-ovatis petiolatis obtusis crenato-serratis basi rotundatis supra basin subtrinerviis vel distincte penniveniis crassiusculis supra in nervis paullo puberulis aliter glabris rugosis post exsiccationem nigrescentibus subtus multo pallidioribus sordide lanulatis 1.5–2.2 cm. longis 9–14 mm. latis; petiolo 2–4 mm. longo; corymbis (immaturis) compactis terminalibus convexis 3–4.5 cm. diametro multicapitulatis; capitulis ca. 15-floris ca. 10 mm. longis; pedicellis ca. 2 mm. longis; involucri squamis ca. 14 subaequalibus oblongis apice rotundatis margine ciliolatis dorso brunneo-tomentellis, plerisque ca. 5–5.5 mm. longis et 2 mm. latis, extimis 2–3 brevioribus ca. 3–4 mm. longis et 1 mm. latis, intimis 1–2 angustis; receptaculo parvo planiusculo; corollae glabrae tubo proprio gracili 2 mm. longo, faucibus cylindratis ca. 4 mm. longis, limbi dentibus anguste deltoideis ca. 0.6 mm. longis; antheris apice cum appendice oblongo hyalino instructis; achaeniis ca. 2.8 mm. longis in angulis dense glanduliferis; pappi setis 45–50 ca. 5.5 mm. longis albidis inaequalibus vix scabratis in apices attenuatis.—PERU: above Huancabamba, Prov. Huancabamba, Dept. Piura, alt. 3200–3300 m., Apr., 1912, *Dr. A. Weberbauer*, no. 6045 (TYPE, Field Mus. Nat. Hist., phot. and fragm. Gr.).

This characteristic plant may perhaps best be placed near *E. cutervense* Hieron. which it resembles somewhat in habit and small short-petioled leaves. However, it differs much in its dense inflorescence, in leaf-form, in its lanulate indument on the lower surface of the leaves, and fewer-flowered, smaller heads.

E. POLYCEPHALUM Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 338, t. 88 (1876). This name was employed in herbaria by Schultz for material clearly conspecific with *E. bracteatum* Gardn. in Hook. Lond. Jour. Bot. v. 472 (1846). When preparing his treatment of *Eupatorium* for the Flora Brasiliensis Baker maintained Gardner's species and mentioned *E. polycephalum* Sch.-Bip. in its synonymy. He also reduced the earlier *E. bracteatum* Hook. & Arn. Comp. Bot. Mag. i. 239 (Mar., 1836) to the position of a variety of *E. tozziaefolium* DC. Prod. v. 146 (Sept., 1836).

It is evident that this course is not in accord with the International Rules in Nomenclature. *E. bracteatum* Hook. & Arn. is now known to have had some months of priority over *E. tozziaefolium* DC. and cannot be reduced to it, even in varietal status. The matter is somewhat complicated by the circumstance that *E. congestum* Hook. & Arn. Comp. Bot. Mag. i. 239 (Mar., 1836) was also closely of this

affinity and was also considered by Baker conspecific with *E. tozziaefolium* DC., being indeed regarded as representing the typical variety of that species, while *E. bracteatum* Hook. & Arn. was treated by Baker as a variety. It may be added that *E. bracteatum* has a slight page-priority over *E. congestum*. To the writer, who has studied photographs and bits of the types concerned, it seems pretty clear that their differences are sufficient to prove them separate species. Therefore, it becomes necessary to make the following nomenclatorial readjustment.

E. CONGESTUM Hook. & Arn. Comp. Bot. Mag. i. 239 (Mar., 1836). *E. tozziaefolium* DC. Prod. v. 146 (Sept., 1836).

E. BRACTEATUM Hook. & Arn. Comp. Bot. Mag. i. 239 (Mar., 1836).

E. POLYCEPHALUM Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 338, t. 88 (1876). Name published in synonymy but here raised to full specific rank being associated with Baker's adequate diagnosis of *E. bracteatum* Gardn. Under the specific name *E. polycephalum* Sch.-Bip. may be placed the synonym *E. bracteatum* Gardn. in Hook. Lond. Jour. Bot. v. 472 (1846). Of the species *E. polycephalum* three varieties may be distinguished:

Var. **typicum**, foliis dentato-crenatis vel saepe subintegris.

Var. **pinnatifidum** (Bak.), comb. nov., foliis leviter pinnatifido-lobulatis.—*E. bracteatum*, var. *pinnatifida* Bak. l. c. 339 (1876).

Var. **racemosum** (Bak.), comb. nov., foliis angustius oblanceolatis majus venulosis, indumento laxiori cum glandulis intersperso.—*E. bracteatum*, var. *racemosa* Bak. l. c. 339 (1876).

E. (§ **Eximbricata**) **prinodes**, spec. nov., fruticosum; caulibus teretibus a cortice laevi pallide griseo tectis apicem versus saepius copiose ramosis; ramis adscendenter patentibus juventate pubentibus deinde glabratis; foliis oppositis breviter petiolatis ovato-oblongis acutis pungenter dentatis (dentibus plerisque 1–2 mm. altis et 5–9 mm. inter se distantibus) basi rotundatis vel brevissime cordatis paullo supra basin 3–5-nervatis 3.5–6.5 cm. longis 1.5–2.8 cm. latis textura coriaceis utrinque viridibus subnitidis reticulato-venulosis supra glaberrimis subtus vix pallidioribus aliquando in costa prope basin obsolete puberulis; petiolo crassiusculo saepius brunnescenti 3–5 mm. longo plerumque patenter villosulo; corymbis ad apicem ramorum subsessilibus 3–8 cm. diametro convexis pauci- vel saepius multicapitulatis glabris vel paullo pubentibus; capitulis ca. 20-floris 7–8 mm. longis; pedicellis nigrescentibus 3–8(–12) mm. longis; involucri squamis ca. 18 anguste linearibus attenuatis glabris persisten-

tibus; receptaculo parvo planiusculo nudo; corollis fere tubulatis 2.8 mm. longis limbum versus resinoso-granulatis aliter glabris sursum gradatim ampliatis sine faucibus distinctis; dentibus limbi deltoideis recurvatis; antheris apice bene appendiculatis; achaeniis olivaceis 2.4–2.7 mm. longis deorsum decrescentibus in costis sursum ciliolatis; pappi setis ca. 35 albis sublaevibus ca. 2.2 mm. longis attenuatis.—CUBA: Province Oriente: in shady places below Yunipero in the Sierra de Nipe at the foot of Loma Mensura, alt. 725 m., 11 July, 1919, *Ekman*, no. 9709 (TYPE, in Gray Herb.); in thickets, Loma de Estella, Sierra de Nipe, 18 June, 1915, *Ekman*, no. 5797 (Gr.); Loma Mensura in Sierra de Nipe at the foot of the mountains, 19 Oct., 1914, *Ekman*, no. 3167 (Gr.).

In its incisely toothed short-petioled leaves of firm texture as well as in its narrow, firm and acute phyllaries this species bears some slight resemblance to *E. incisum* Griseb., but that is essentially herbaceous, has ovate rather than ovate-oblong leaves (pubescent on both surfaces) and pedunculate corymbs.

E. PYCNOCEPHALUM Less. Linnaea vi. 404 (1831). Although long known to exhibit considerable variation of leaf-contour, density of inflorescense, etc., this species has been treated thus far as a polymorphous aggregate, and little effort has been made to name its forms, most of which are probably mere inconstant combinations of characters subject to independent variation. Somewhat better marked appears to be the following:

Var. **caucanum**, var. nov., foliis quam apud formam typicam minoribus saepius 2–3 cm. longis; corymbulis paniculatim dispositis plerumque 2–5(–7)-capitulatis quam apud formam typicam laxioribus; pedicellis plerisque 2–7 mm. longis; corollis albis.—COLOMBIA: Department of El Cauca: woodland, between Rio Ortega and "El Ramal," Cordillera Occidental, alt. 1900–2200 m., July 2, 1922, *Pennell & Killip*, no. 8072 (TYPE, in Gray Herb.).

This variety recalls some plants of eastern Brazil in which the heads are more loosely disposed than elsewhere characteristic of the species, but it cannot be closely matched with any of them and it appears to merit record. Indeed it is probable that it would be regarded as fully worthy of specific rank were it not for the already mentioned variability of *E. pycnocephalum* with which it agrees surprisingly in many details of its involucre, etc.

E. (§ **Eximbricata**) **rhodopappum**, spec. nov., herbaceum perenne ut videtur adscendens 4 dm. vel ultra altitudine; caule tereti brunnescenti-griseo minute villosulo (villis tenuibus subappressis

purpureo-articulatis); medulla post exsiccationem viridescenti-flavida; internodiis plerisque 3–6 cm. longis; foliis oppositis graciliter petiolatis ovato-oblongis acuminatis argute serratis (dentibus ca. 1 mm. altis 3–5 mm. inter se distantibus cuspidatis) basi obtusis vel rotundatis textura membranaceis supra basin 5(–7)-nervatis untrique supra in nervis obsolete puberulis aliter glabris depresse reticulatis subtus sordide in nervis et venulis hirtellis 4–6.7 cm. longis 1.5–3 cm. latis; petiolo 1.5–1.8 cm. longo crispe et subappresse puberulo non glanduloso; corymbis terminalibus convexis laxiusculis plerisque 2.5–5 cm. diametro; pedicellis filiformibus 8–24 mm. longis dense hirtellis capitulis ca. 30-floris 7 mm. altis 8 mm. diametro; involucri campanulati squamis subaequalibus ca. 16, exterioribus lanceolato-linearibus acutis fuscis dense hirtellis 2.5–3 mm. longis vix costulatis, interioribus lineari-oblongis obtusiusculis tenuioribus ca. 3 mm. longis et 0.7 mm. latis plerumque 2-costulatis substramineis; corollis ut videtur albis limbum versus hirtellis; tubo proprio gracili ca. 1.6 mm. longo; faucibus campanulati-subcylindratis ca. 1.7 mm. longis; dentibus limbi deltoideis ca. 0.5 mm. longis; achaeniis (immaturis) ca. 1.5 mm. longis; pappi setis ca. 17 pulcherrime (saltem post exsiccationem) roseis ca. 3 mm. longis basin versus albidis.—COLOMBIA: Department of Caldas: open rocky stream bank, Rio San Rafael, below Cerro Tatama, Cordillera Occidental, alt. 2500–2800 m., *Dr. Francis W. Pennell*, no. 10,424 (TYPE, in Gray Herb.).

This species, obviously close to *E. pichinchense* HBK., differs in its ovate-oblong rather than broadly ovate leaves, its considerably shorter and less spreading inflorescence, somewhat less numerously flowered heads, and bright roseate pappus. Its greenish-yellow, chambered pith is also a peculiar character not observed elsewhere in *Eupatorium*. Persistent effort has failed to place this plant in any hitherto known species.

E. (§ **Subimbricata**) **rhodotephrum**, spec. nov., multicaule decumbens basin versus lignescens gracile debile pubescens; caulibus teretibus viridibus plus minusve violascenti-tinctis costulatis usque ad 2 m. longis et 4 mm. diametro albo-medullosis; internodiis 2–16 cm. longis; foliis oppositis petiolatis deltoideo-ovatis vel ovato-lanceolatis acuminatis grosse crenato-dentatis basi cordatis vel subtruncatis vel rotundatis utrinque viridibus et pubescentibus subtus vix pallidioribus textura membranaceis a basi 3(–5)-nervatis 4–6.5 cm. longis 1.7–4 cm. latis translucente reticulatis; petiolis gracilibus 1.5–2.5 cm. longis villosulis (villis purpureo-articulatis); corymbis terminalibus et lateralibus laxiusculis plus minusve irregularibus;

bracteolis lanceolatis 3–7 mm. longis; pedicellis filiformibus 8–10 mm. longis; capitulis ca. 20-floris 6 mm. altis 3.5 mm. diametro; involucri squamis ca. 20 ca. triseriatim imbricatis roseo-griseis tenuibus dorso dense hirtellis, exterioribus lanceolatis attenuatis, intermediis acuminatis, interioribus anguste oblongis acutis vel acutiusculis ca. 6 mm. longis et 1 mm. latis; receptaculo plano glabro; corollis roseis vel lilacinis limbum versus paullo hispidulis aliter glabris; tubo proprio ca. 1.3 mm. longo; faucibus paullo ampliatis cylindratis ca. 3 mm. longis; dentibus limbi deltoideis ca. 0.6 mm. longis; achaeniis glaberrimis 2 mm. longis maturitate atrobrunneis vel nigris cum costis pallidis; pappi setis ca. 27 basi in annulo brevissime connatis.—PERU: Department of Huanuco: in canyon, stems many, woody below, weak, becoming 1.2 m. long if among other shrubs; flowers old rose, fragrant, Yanahuanca, alt. 3050 m., June 16–22, 1922, *Macbride & Featherstone*, no. 1228 (TYPE, in Field Mus., isotype Gr.); dense thicket floor, stems 0.6–1.2(–1.8) m. long, flowers pink; vernacular name "macha macha," Mito, alt. 2750 m., July 8–22, 1922, *Macbride & Featherstone*, no. 1508 (Field Mus., Gr.); open thicket on stream bank, 0.6–1.5 m. high, flowers lavender, 24 km. southeast of Huanuco, alt. 3200 m., May 31–June 3, 1922, *Macbride & Featherstone*, no. 2097 (Field Mus., Gr.).

This species, admirably shown in copious material of three collections, approaches most nearly *E. gracilentum* Robinson, but that is a considerably smaller plant with leaves (only 1.8–3 cm. long) more copiously pubescent, in fact tomentellous beneath; corolla somewhat shorter, and achenes conspicuously ciliated on the angles.

E. (§ **Eximbricata**) **rhypodes** Robinson, Proc. Am. Acad. lv. 28 (1919). This species is found to be capable of the following formal subdivision.

Forma α. **typicum**, manifeste viscidum; caule et ramis et pedicellis glanduloso-tomentosis; pilis capituliferis; inflorescentia sublaxa.—ECUADOR: Vicinity of Las Juntas, *Rose, Pachano & Rose*, no. 23,179 (Gr., U. S., N. Y.).

Forma β. **agloeum**, forma nov., multo minus viscosum vel omnino non viscosum; caule etc. setuloso-tomentoso; pilis attenuatis nec capituliferis; inflorescentia densiuscula.—PERU: Palea [Palca?], *Dombey* (Par., phot. and small frag. Gr.). The label of Dombey bears the words "guaxmi guaxmi" presumably a memorandum of a local vernacular name.

E. (§ **Eximbricata**) **rhytidodes**, spec. nov., fruticosum 2 m. altum; caulibus gracilibus flexuosis teretibus 3 mm. diametro albo-

medullosis juventate parce setuliferis tardius glabratis griseo-brunnescentibus; internodiis 9–13 cm. longis; foliis oppositis petiolatis ovatis acutis serratis basi cordatis a basi 5(–7)-nervatis supra (post exsiccationem) atrobrunneis glabris lucidulis valde rugosis subtus pallide viridibus prominulenter reticulatis in nervis venisque patenter setuliferis textura firmiter membranaceis 5–6 cm. longis 3–4.5 cm. latis; petiolis gracilibus 1.5–2.5 cm. longis; corymbis terminalibus compositis rotundatis foliaceo-bracteatis; partialibus 3–6 cm. diametro valde convexis; pedicellis plerisque 4–9 mm. longis; capitulis ca. 24-floris ca. 7 mm. altis et 6 mm. diametro; involucri squamis lanceolato-linearibus acutis plerumque 3-costulatis brunneis apicem versus paullo hirtellis, interioribus subaequalibus ca. 4.5 mm. longis, exterioribus 2–3 parvis brevioribus; corollis albis; tubo proprio gracili 2 mm. longis; faucibus cylindratis 2 mm. longis; dentibus limbi anguste deltoideis ca. 0.7 mm. longis dorso cum setulis 1–3 minutis instructis; achaeniis maturitate nigrescentibus, 2.2 mm. longis parce in angulis hirtellis; pappi setis ca. 26 delicatule capillaribus flavescenti-albis minute scabratis ca. 3 mm. longis sursum non incrassatis.—PERU: Dept. Huanuco: very slender-stemmed shrub in sunny thicket; flowers white, fragrant, Muña, alt. 2135 m., May 23–June 4, 1923, *J. Francis Macbride*, no. 3985 (TYPE, in Field Mus., isotype Gr.).

This species seems well marked among the Andean Eupatoriums. Its round-ovate firmish leaves are peculiarly rugulose on their glabrous upper surface and are setulose on the prominent nerves and veins beneath.

E. (§ **Subimbricata**) **rivulorum**, spec. nov., herbaceum perenne gracile ramosum ubique minute puberulum; caule subtereti obscure striato 1.5–2 mm. diametro viridi vel purpurascenti debili albo-medulloso; internodiis 2–8 cm. longis; foliis oppositis petiolatis lanceolatis gradatim acutatis apice attenuatis vel acutis vel obtusiusculis margine a media parte serratis vel crenato-serratis (dentibus paucis utroque 2–7) basi cuneatis integris ima a basi 3-nervatis utrinque viridibus obscure puberulis concoloribus 2–3.5 cm. longis 8–15 mm. latis membranaceis; petiolo gracili 5–10 mm. longo; paniculata terminali laxiuscula irregulariter saepe alternatim ramosa foliaceo-bracteata 1.5–3 dm. alta et crassa; pedicellis 3–12 mm. longis; capitulis ca. 40-floris ca. 6 mm. altis et crassis; involucri campanulati squamis ca. 30 subtriseriatim imbricatis viridibus acutis plerumque 2-costulatis obscure puberulis, extimis anguste lanceolati-linearibus attenuatis 2 mm. longis, intermediis ovati-lanceolatis peracutis, intimis lineari-oblongis breviter acutatis ca. 4 mm. longis

et 0.8 mm. latis; corollis roseo-lilacinis tubulatis sursum paullo gradatim ampliatis puberulis 3.3 mm. longis; dentibus limbi brevibus late deltoideis vix 0.2 mm. longis; achaeniis nigris 1.3 mm. longis sursum praecipue in costis brevissime hispidulis basi pallide callosis; pappi setis ca. 12 delicatule capillaribus albis ca. 3 mm. longis.—MEXICO: State of Chiapas: on rocks in the creeks east of Monserrate, March, 1925, *Dr. C. A. Purpus*, no. 34 (TYPE, in U. S. Nat. Herb. and Gray Herb.).

This species in habit, habitat, foliage, and in some details of pubescence recalls *Fleischmannia arguta* (HBK.) Robinson, but has smaller heads in a more developed panicle, a more imbricated involucre, with more ovate intermediate phyllaries and also indefinite (mostly 11–12) pappus-bristles. The species, if referred to *Fleischmannia*, would by its indefinite (though not very numerous) pappus-bristles break down the slight distinction between that genus and *Eupatorium*. If, on the other hand, it is referred to *Eupatorium* (from which on technical grounds it cannot be readily separated) its close similarity to *Fleischmannia* must render the further separation of that genus rather artificial. Neither disposition is entirely satisfactory.

E. (§ **Subimbricata**) **Ruckeri**, spec. nov., grande ut videtur herbaceum perenne inflorescentia paullo puberula excepta aspectu glaberrimum; caule infra subtereti sursum paullo angulato fistuloso; foliis oppositis graciliter petiolatis ovatis obtusis vel apice angustatis et deinde rotundatis in lateribus grosse crenato-lobulatis vel grosse dentatis basi obtusis vel rotundatis utrinque obscurissime in nervis puberulis aliter glaberrimis subcarnosis ca. 8–10 mm. supra basin 3-nervatis 7–13 cm. longis 4–8 cm. latis impunctatis; dentibus plerisque 2–9 mm. altis et basi latis apice rotundatis; petiolis 2.3–4.7 cm. longis exalatis, eis ejusdem jugi basi paullo connatis; corymbo terminali denso rotundato 3 cm. vel ultra diametro breviter sordideque puberulo; bracteis linearibus ca. 6 mm. longis; capitulis ca. 60-floris 9 mm. altis 10 mm. diametro pedicillatis; involucri campanulati squamis viridibus subcarnosis oblongis obtusis vel apice rotundatis, intimis 5.5 mm. longis 1.5 mm. latis eroso-ciliolatis, exterioribus paucis gradatim brevioribus lanceolato-linearibus; corollis pallidis glabris limbum versus purpureo-roseis ca. 5 mm. longis tubulatis paullo limbum versus gradatim ampliatis sine faucibus distinctis; antheris apice cum appendice membranacea obtusissima ornatis; achaeniis immaturis ca. 2.3 mm. longis glabris; pappi setis ca. 4 mm. longis.—CUBA: Province Oriente: Sierra Maestra, on rocks at Casa Piedra,

Rio Yara, Aug. 10, 1922, *E. L. Ekman*, no. 14,834 (Brl., phot. and fragm. Gr.); a "tall weed" in windfall, Loma Cardero, Pico Tarquino, Oct. 12–14, 1924, *G. C. Rucker*, no. 45 (TYPE, in herb. of N. Y. Bot. Gard., phot. and fragm. Gr.).

This species bears considerable resemblance to *E. Shaferi* Robinson and *E. iodostylum* Robinson, but has heads with many more florets and strikingly lobulate, ovate, blunt-based leaves on long slender wingless petioles. Dr. Ekman's specimen showed sterile shoots only and proved indeterminate until through the kindness of Dr. Britton the author was able to see the rather scanty but flowering material collected by Mr. Rucker and now in the herbarium of the New York Botanical Garden.

E. SANCTOPAULENSE Robinson, Contrib. Gray Herb. n. ser. lxviii. 32 (1923). Since the description of this Brazilian species (of § Praxelis) founded upon Saint-Hilaire's no. 1401 three additional collections of the plant have come to the attention of the author, being as follows: São Paulo, 1840–46, *Gustave Perdonnet*, no. 274 (hb. Univ. Geneva); meadows, Santa Ana, São Paulo, Feb. 22, 1922, purple-flowered, *Prof. & Mrs. E. W. D. Holway*, no. 1587 (Gr.); and between Ipanema and Sorocaba, Campo of Ipiranga, São Paulo, *Glaziou*, no. 16,190 (Copenh.). This newly examined material agrees closely with the original specimen of Saint-Hilaire and yields some data regarding the base of the plant which was not shown in the type material. Glaziou's excellent specimen shows that the plant is an essentially erect, slender perennial herb 5–6 dm. high with 4–7 stems from a hard woody globular corm 6–8 mm. thick and provided with several subsimple tough slender fibrous roots. This number is reported in Glaziou's list, Bull. Soc. Bot. Fr. lvi. Mém. 3, 389 (1909) as *E. kleinioides* HBK., but of course is readily distinguished from that species by its involucre with blunter phyllaries, as well as its perennial nature.

E. (§ **Subimbricata**) **scabrifolium**, spec. nov., lignosum valde elongatum scandens dumeta alnorum penetrans usque ad 15 m. longum; caule juventate patenter pallide pubescenti et fuliginoso-sordido tardius glabrato et cum cortice pallide grisea lenticellata obtecto; ligno albo denso; medulla alba parva; internodiis 8–15 cm. longis; foliis oppositis petiolatis lanceolatis vel lanceolato-ovatis longe attenuatis margine revolutis vel integris vel paullo undulatis vel plus minusve cuspidato-denticulatis basi breviter cuneatis vel subrotundatis 7–11 cm. longis 1.5–4 cm. latis in parte tertia proximali pinnatim 7–11-nervatis supra scaberrimis bullato-rugulosis subtus prominulenter reticulatis tenuiter pubescentibus textura chartaceo-

coriaceis subconcoloribus; petiolo gracili 5–12 mm. longo; corymbis terminalibus trifidis 10–14 cm. diametro subdensis fuliginoso-sordidis; capitulis sessilibus vel breviter (0.5–1.5 mm. longe) pedicellatis ca. 9-floris ca. 7 mm. longis; involucri squamis ca. 3-seriatim imbricatis apice rotundatis plerisque 3-costatis fusco-ciliolatis dorso paullo puberulis apicem versus saepe purpureo-tinctis, exterioribus late ovatis, interioribus ellipticis vel oblanceolatis; corollis limbum versus lilaceis gracilibus; tubo ca. 4.2 mm. longo sine faucibus distinctis; dentibus limbi deltoideis 0.6 mm. longis et 0.5 mm. latis extus minute granulatis; receptaculo parvo plano glabro; achaeniis maturitate nigris 2 mm. longis basi pallide callosis in angulis minute pubentibus in faciebus parce granulatis; pappi setis 35–40 stramineo-albis attenuatis vix scabratis ca. 3.8 mm. longis.— PERU: Dept. Huanuco: liana, much branched above to 8 m., flowers lilac; in alders of dense stream jungle, Mito, alt. 2745 m., July 23–Aug. 14, 1922, *Macbride & Featherstone*, no. 1873 (TYPE, in Field Mus., isotype Gr.); liana-shrub in montaña, flowers purple, Yanano, alt. 1830 m., June 29, 1923, *Macbride*, no. 4937 (Field Mus., Gr.).

This species differs from *E. trachyphyllum* Hieron. in its much broader, firm, and purple-stained phyllaries, and shorter, more deeply colored corollas. From *E. inulaefolium* HBK. it differs in the leaf-form, which is not so rhombic-ovate, in the leaf-indument which is both shorter and harsher, and in the broader more deeply-colored phyllaries. It appears furthermore to be of quite different habit, being a liana, rather than an erect shrub.

E. (§ **Eximbricata**) **silvaticum**, spec. nov., fruticosum ramis gracilibus vix 2 mm. diametro curvato-adscendentibus striato-costulatis griseo-brunneis vel atropurpureis brevissime puberulis et juventate cum glandulis lucidis sessilibus ornatis; internodiis 1.4–3.7 cm. longis; foliis ovato-lanceolatis gradatim acutatis breviter cuspidato-serratis basin versus integris basi subacutis vel rotundatis textura coriaceis supra viridibus punctatis cum atomis lucidis ornatis alite glabris levissime sed dense reticulatis subtus subolivaceis densissime punctatis glabris laxe reticulatis supra basin 3-nervatis 2.5–3.2 cm. longis 8–11 mm. latis; petiolo 2–3 mm. longo supra canaliculato; corymbis terminalibus laxiusculis 3–6 cm. altis 5–9 cm. diametro; bracteis parvis lanceolato-linearibus 1–9 mm. longis; pedicellis filiformibus minute puberulis 4–10 mm. longis; capitulis ca. 14-floris 5–6 mm. altis; involucri turbinati-campanulati ca. 4 mm. longi squamis interioribus ca. 12 subaequalibus anguste oblongis vix acutis dorso saepe purpurascentibus puberulis, squamis exterioribus 2–4

linearibus acutis multo brevioribus; corollis ca. 3 mm. longis pallidis glanduliferis tubulatis sine faucibus distinctis; dentibus limbi brevibus vix 0.3 mm. longitudine; achaeniis ca. 1.5 mm. longis minute puberulis; pappi setis ca. 25 albidis sublaevibus corollam subaequantibus.)—CUBA: Province Oriente: in the edge of woods, Sierra de Nipe, 4 Oct., 1919, *Ekman*, no. 9811 (TYPE, in Gray Herb.).

This species in most characters closely resembles *E. polystictum* Urb., but differs so decidedly in its ovate-lanceolate acute and less reticulated leaves and its longer pedicels with consequent looser inflorescence, as to have a rather different habit. *E. polystictum* is now represented in herbaria by a fairly good series of specimens from several localities. While these show some minor variations of dimensions, texture, etc., no material hitherto obtained approaches in leaf-form or in inflorescence the plant here described. It therefore seems best, in the absence of evident intergradation, to treat it as a distinct species.

E. (§ **Eximbricata**) **simillimum**, spec. nov., fruticosum vel arboreum 4–6 m. altum in inflorescentia et in nervis foliorum immaturorum puberulum vel brevissime sordide tomentellum aliter glaberrimum; caule 1–3 dm. crasso; ramis pallide griseis subteretibus cum lenticellis ornatis; ramulis brunnescentibus costato-angulatis; foliis oppositis petiolatis ovato-oblongis acuminatis obtuse serratis basi plerumque rotundatis mox glabratis membranaceis conspicuiter supra basin pinnatim ca. 5-nervatis tenuibus post exsiccationem subnigrescentibus 8–12 cm. longis 3–5.5 cm. latis; petiolo 1–1.8 cm. longo; inflorescentia ampla terminali thysoidea saepe composita basi vel ad mediam partem foliaceo-bracteata; pedicellis gracilibus puberulis saepe curvatis 3–10 mm. longis; capitulis ca. 15-floris 1 cm. altis; involucri squamis ca. 11, extimis 2–3 lanceolatis brevioribus ca. 3.8 mm. longis attenuatis subherbaceis, intermediis oblongis obtusis mucronatis obscure 3-nerviis 4.7–5.5 mm. longis 1.2–1.4 mm. latis, intimis 1–2 linearibus obtusis vix 0.7 mm. latis; receptaculo plano nudo; corollis ca. 5 mm. longis sparse glanduliferis albidis; tubo proprio ca. 2.7 mm. longo; faucibus vix amplatis ca. 2 mm. longis; dentibus limbi brevibus; achaeniis ca. 3 mm. longis gracilibus in costis paullo glandulari-scabratis; pappi setis ca. 40 inaequalibus corollam subaequantibus albidis.—*E. laeve*, var. *macrophyllum* Chod. Bull. Herb. Boiss. ser. 2, ii. 310 (1902). *E. laeve*, var. *pubens* Robinson, Contrib. Gray Herb. lxv. 49 (1922).—PARAGUAY: A low tree, in bushy woods, Feb. 7, 1879, *Lorentz*, no. 11 (Berl.); in woods, Cordillera de Altos, Dec., 1898, *Hassler*, no. 3585 (hb. Univ. Geneva); same locality,

Oct. 20, 1902, *Fiebrig*, no. 277 (TYPE, Gray Herb.); in the region of Lake Ypacaray, March, 1913, *Hassler*, no. 12,147 (Gr., Copenh.); in woods, Paraguari, Aug., 1914, *Chodat*, no. 403 (hb. Univ. Geneva).

This tree of Paraguay bears a close habital resemblance to *E. laeve* DC., a recognized dye-plant of Brazil. However, the two were long ago seen to be somewhat different and attempts have been made to give at least varietal distinction to the Paraguay plant upon leaf-form or pubescence. More thorough examination, now possible through the availability of more copious material, proves them to have a number of seemingly constant differences, indicating that they are in reality separate though nearly related species. In the Brazilian *E. laeve* the leaves are for the most part smaller, more oblong than ovate and more sharply toothed (as correctly shown in plate 93 illustrating the species in the Flora Brasiliensis); the inflorescence is strictly glabrous; the heads are slightly smaller (about 9 mm. long) and the florets tend to be more numerous (about 20); the corollas are shorter (about 4 mm. long), the pappus more distinctly yellowish; and the phyllaries narrower and all acute, as well as of firmer texture.

E. (§ **Subimbricata-Eximbricata**) **sinaloense**, spec. nov., erectum gracile herbaceum verisimiliter perenne, ca. 7 dm. altum; caule tereti viridi-striato crispe puberulo ca. 2 mm. diametro albo-medulloso; foliis oppositis graciliter petiolatis ovatis acuminatis argute grosseque serrato-dentatis basi abrupte angustatis imam ad basin breviter acutatis vel subacuminatis untrinque viridibus supra sparse pubentibus subtus in nervis venisque crispe puberulis ima a basi 3-nervatis usque ad 6 cm. longis et 3 cm. latis tenuibus membranaceis; petiolo plerumque 1.5–2 cm. longo; corymbis multis parvis 1–3 cm. diametro densiusculis convexis ramos superiores terminantibus conjunctim in paniculam laxam elongatam folioso-bracteatam dispositis; pedicellis filiformibus 2–3 mm. longis; capitulis ca. 25-floris ca. 4.2 mm. longis et 3.3 mm. diametro; involucri turbinato-campanulati squamis ca. 15 valde inaequalibus acutis viridibus, extimis lanceolatis gradatis, intimis lineari-oblongis saepius 2-costulatis; receptaculo paullo convexo nudo; corollis glabris albis 2 mm. longis; tubo proprio brevissimo vix 0.5 mm. longo; faucibus subcylindratis ca. 1.2 mm. longis sursum paullo ampliatis; dentibus limbi 0.4 mm. longis ovato-deltoideis delicatule papillosis; achaeniis ca. 1.2 mm. longis in costis sursum hispidulis; pappi setis ca. 22 capillaribus albis ca. 1.5 mm. longis.—MEXICO: Cerro Colorado near Capradea, Sinaloa, Nov. 1, 1904, *T. S. Brandegee* (TYPE, in Gray Herb.); also Sinaloa without more precise locality, 1922, *J. G. Ortega*, no. 4426 (Gr., U. S.).

A species somewhat resembling the common *E. pycnocephalum* Less. but easily distinguished by its more delicate habit, smaller heads and acute phyllaries. Mr. Brandegee distributed his specimens as a form of *E. pauperculum* Gray, a species which, however, has lanceolate less coarsely toothed leaves usually 3-nerved from above the base, distinctly larger heads, and more pubescent campanulate and less calyculate involucre. *E. sinaloense* has an involucre with graded scales but with little imbrication and falls somewhat between the typical development of § § *Subimbricata* and *Eximbricata*.

E. (§ **Subimbricata**) **Standleyi**, spec. nov., herbaceum 1.2–3 m. altum primo erectum deinde in arbores conscendens inflorescentia excepta glabrum vel subglabrum; caule subtereti crasso fistuloso post exsiccationem costulato; foliis oppositis petiolatis ovato-oblongis subacutis vel obtusis margine grosse dentatis basi breviter cuneatis penniveniis subcarnosis utrinque glabris supra viridibus subtus paullo pallidioribus 12–16 cm. longis 7–9 cm. latis; petiolo 3–4.5 cm. longo supra sulcato; panicula terminali 2–3 dm. lata composita sublaxa puberula; capitulis ca. 6-floris 8 mm. altis 4 mm. diametro pedicellatis a bracteola lineari ca. 2 mm. longa suffultis; involucri squamis ca. 8 valde inaequalibus acutis vel subobtusis dorso glabris margine ciliolatis, extimis ovatis ca. 2.6 mm. longis 1.7 mm. latis, intermediis 2.5 mm. longis 1.4 mm. latis, intimis 5.5–7.5 mm. longis 0.7–1.2 mm. latis; corollis roseis 5 mm. longis glabris; tubo proprio gracili 2.2 mm. longo; faucibus ampliatis subcylindratis 2.2 mm. longis; dentibus limbi deltoideis 0.6 mm. longis; achaeniis gracilibus glabris 2.5 mm. longis; pappi setis ca. 40 corollam longitudine aequantibus flavescentibus sublaevibus.—COSTA RICA: brushy slope, a shrub 3 m. high, climbing over a tree; flowers pink, Alto de La Estrella, Province of Cartago, Mar. 26, 27, 1924. *Standley*, no. 39,288. (TYPE, in U. S. Nat. Herb., isotype Gr.); also as herb 1.2 m. high in wet forest, La Hondura, Province of San José, alt. 1300–1700 m., Mar. 16, 1924, *Standley*, no. 37,816 (U. S., small fragm. Gr.).

This species, very clearly distinct from any known to the writer from north of the Isthmus of Panama, bears a curiously close resemblance in habit, texture, toothing, venation of its leaves, in the general nature of its involucre and even in its yellowish pappus to the recently discovered *E. Hitchcockii* Robinson of central Ecuador which, however, has somewhat broader leaves, heads which are about 20-flowered, and a more tubular corolla. There seems to be no doubt that the resemblance is merely habital and that the two are distinct species. It is a pleasure to commemorate in naming this new plant of Costa

Rica the very notable services of its collector, Mr. Paul C. Standley, both in the exploration and record of the tropical American floras.

E. (§ **Conoclinium?**) **tatamense**, spec. nov., herbaceum scandens dense tomentosum; caule tereti ad 5 mm. diametro; indumento patenti uno latere atropurpureo; pilis (saltem juventate) attenuatis purpureo-nodulosis; internodiis plerisque 6–7 cm. longis; foliis oppositis vel aliquando alternis petiolatis ovatis acuminatis crenato-dentatis basi sinuato-cordatis uno latere vel utroque angulatis vel breviter unilobatis a basi 3-nervatis supra sordide viridibus dense papilloso-puberulis maturitate rugulosis subtus griseo-viridibus tomentosis reticulato-venosis 9–12 cm. longis 6–9 cm. latis crassiusculeque membranaceis; petiolo ca. 4 cm. longo; panicula terminali patenter oppositiramea folioso-bracteata; pedicellis ca. 5 mm. longis; capitulis ca. 55-floris ca. 1 cm. altis et crassis; involucri squamis 3–4-seriatim imbricatis sed non distincte gradatis lanceolatis caudato-attenuatis tenuibus laxe villoso-hirtis plerisque 3–6 mm. longis; corollis sordide purpureis glabris; tubo proprio gracili ca. 2.5 mm. longo; faucibus graciliter turbinato-subcylindratis 2.5 mm. longis; dentibus limbi ca. 0.4 mm. longis; achaeniis (immaturis) glabris pallide brunneis 2 mm. longis; pappi setis ca. 30 sublaevibus flavescenti-albis attenuatis basin versus firmiusculis.—COLOMBIA: Dept. of Caldas: a climbing herb on a rocky stream-bank in forest, Rio San Rafael, below Cerro Tatama, alt. 2500–2800 m., Sept. 7–11, 1922, *Dr. F. W. Pennell*, no. 10,426 (**TYPE, in Gray Herb.**).

This plant was first taken for a form of *E. diplodictyon* Robinson, but further study has shown that it differs from that species in its blunter-toothed, much more copiously and softly tomentose leaves which are less clearly and sharply double-netted, in its much more open paniculate inflorescence, smaller heads, relatively shorter, much more numerous phyllaries and more numerous florets. Furthermore, the deltoid-ovate leaves often have their basal lobes externally angled instead of rounded as in *E. diplodictyon*.

In the rather immature heads as yet available for dissection the receptacle is only moderately convex, but it would presumably become more so at a later stage of development, and, as the affinities of the plant are seemingly with *E. diplodictyon* and *E. lamiifolium* HBK., it is provisionally, though with some doubt, referred to § *Conoclinium*.

E. (§ EXIMBRICATA) TONDUZII Klatt, Beibl. z. Leopoldina 1895, 4 (1895). This smoothish shrub of Costa Rica, collected by Tonduz on the Cuesta de Tarrazu more than thirty years ago, has until now remained rather problematic. It was described by Klatt, apparently

from defective material, and its representation in the Klatt herbarium, now in possession of the Gray Herbarium, consisted merely of two detached dark brown leaves and the remains of an inflorescence long past anthesis from which all the florets had dropped. The beautiful collection of Mr. Standley and his assistants, just at hand, includes five sheets of a slender shrub or lignescent perennial herb, with similarly shaped and crenate-toothed leaves of like texture and also pellucid-reticulate, but with heads no less than 28-flowered, while Klatt states that the heads of *E. Tonduzii* were about 10-flowered. However, a careful examination of the receptacle from one of the heads of the type material in the herbarium of Klatt shows as many as 28 scars from which florets have fallen, and it is clear that Klatt's statement "circiter 10-floris" must have been made on the basis of insufficient examination or possibly from study of an abortive head. Klatt also states that the heads of *E. Tonduzii* are but 1 mm. long. This is pretty clearly a clerical or typographical error for 1 cm., as he later says that the achenes are 1 mm. long. So far as can be seen from the imperfect type material in the Klatt herbarium, *E. Tonduzii* is conspecific with the much more perfect material now obtained by Mr. Standley. As Klatt's description proves in several respects incorrect even in relation to the material from which it was drawn, it seems worth while to place on record a new character for this species on the basis of the far better material now available: Fruticosum vel subherbaceum 9–18 dm. altum puberulum oppositirameum; caulibus gracilibus teretibus primo puberulis maturitate glabratis griseis; internodiis 3–7 cm. vel ultra longitudine; foliis oppositis petiolatis utroque acuminatis crenatis vel crenato-serratis penniveniis utrinque viridibus in costa (saepe rubescenti) obscure puberulis aliter glabris textura membranaceis translucente reticulatis 10–14 cm. longis 3–5.2 cm. latis; petiolo 6–18 mm. longo; corymbis terminalibus compositis leviter convexis folia subtendentia vix aequantibus multicapitulatis; bracteolis filiformibus; pedicellis filiformibus plerisque 5–7 mm. longis; capitulis ca. 28-floris 7 mm. altis 6 mm. diametro; involucri squamis ca. 16 lineari-lanceolatis attenuatis viridibus apicem versus saepe purpureo-tinctis plerisque 2-costulatis ca. 4 mm. longis et 0.7 mm. latis; receptaculo plano glabro; corollis roseo-albis ca. 4 mm. longis limbum versus hirtellis aliter glabris; tubo proprio gracili 1.7 mm. longo; faucibus cylindratis ampliatis 1.7 mm. longis; dentibus limbi ca. 0.6 mm. longis deltoideis; achaeniis nigrescentibus 2 mm. longis in angulis sursum paullo scabratis; pappi setis ca. 20 albis delicatule capillaribus vix scabratis.—Costa Rica: Province of San José:

shrub 1.2–1.8 m. high, common in moist thicket; flowers pinkish white, Laguna de la Chonta, northeast of Santa Maria de Dota, alt. 2000–2100 m., Dec. 18, 1925, *Paul C. Standley*, no. 42,233 (Gray Herb.); shrub, 9–12 dm. high, flowers white, in oak forest near Quebradillas about 7 km. north of Santa Maria de Dota, alt. about 1800 m., Dec. 24, 1925, *Standley*, nos. 42,871 (Gr.) and 42,888 (Gr.); herb 9 dm. high with white flowers, in oak forest, vicinity of Santa Maria de Dota, alt. 1500–1800 m., Dec. 14–26, 1925, *Standley*, no. 41,627 (Gr.); shrub 9–12 dm. high, with pale pink flowers, in wet forest near Finca La Cima, above Los Lotes, north of El Copey, alt. 2100–2400 m., Dec. 21–22, 1925, *Standley*, no. 42,556 (Gr.).

An attractive species recalling *E. ligustrinum* DC., but with thinner impunctate leaves, translucent veins, and much more numerous phyllaries and florets.

E. (§ **Eximbricata**) **triptychum**, spec. nov., fruticosum magnum novellis et inflorescentia exceptis glabrum; caulibus pallide brunneis lucidis 5 mm. vel ultra crassis; cortice tenui post exsiccationem longitudinaliter sulcato cum lenticellis sparsis paullo scabrato; internodiis 10 cm. vel ultra longitudine; foliis oppositis trifoliolatis; petiolo 5–6.5 cm. longo basin versus plus minusve obcompresso et dilatato; petiolulis subaequalibus 10–14 mm. longis supra obscure puberulis; foliolis oblongis acuminatis basi rotundatis vel vix acutatis margine obsolete crenato-undulatis tenuissimis penniveniis utrinque glabris 6–10 cm. longis ca. 3.5 cm. latis; corymbis terminalibus planiusculis compositis subdensis multicapitulatis puberulis ca. 18 cm. diametro; pedicellis filiformibus 6–8 mm. longis; capitulis ca. 12-floris ca. 9 mm. altis et 7 mm. diametro; involucri squamis ca. 12 linearioblongis ca. 4–4.5 mm. longis apice rotundatis brevissime ciliolatis plerisque 2–3(–5)-nervatis dorso glabriusculis, extimis 2–3 multo brevioribus; corollis glabris 6 mm. longis; tubo proprio 0.7 mm. longo; faucibus infundibuliformibus ca. 1.6 mm. longis; dentibus limbi deltoideis ca. 0.8 mm. longis; achaenis nigris 2.5 mm. longis deorsum paullo attenuatis in costis pallidis obscure puberulis; pappi setis paullo inaequalibus sordide albis 4–5 mm. longis sublaevibus.—Costa Rica: large shrub in wet forest, El Muñeco, south of Navarro, Province of Cartago; alt. about 1400 m., Feb. 8, 9, 1924, *Paul C. Standley*, no. 33,458 (U. S., phot. and fragm. Gr.). This species is remarkable for its trifoliolate leaves with clearly petiolulate leaflets. It exhibits no close relationship to any other species. The corolla-throat is unusual, consisting first of a slender tubular portion little differentiated from the proper tube and about 3 mm. long. This at the summit expands

into a turbinate portion about 1.6 mm. high. The anthers bear at the apex the ovate membranaceous appendage usual in the genus.

E. (§ **Eximbricata**) **Weddellii**, spec. nov., subherbaceum vel basin versus paullo fruticulosum 1–4 dm. altum; caule subtereti brunneo vel purpurascenti crispe puberulo (capillis plerisque atropurpureis) a basi usque ad inflorescentiam oppositirameo et folioso; foliis oppositis graciliter petiolatis ovatis ad apicem obtusum vel rotundatum angustatis utroque 3–4-crenato-dentatis basi rotundatis membranaceis a basi 3-nervatis supra viridibus incurvo-puberulis subtus paullo pallidioribus crebre punctatis et in nervis incurvo-puberulis 6–15 mm. longis 4–6 mm. latis; petiolo filiformi flexuoso 3-7 mm. longo; inflorescentia composita in ramis subcorymbosa terminali; pedicellis filiformibus plerumque 1–3.5 cm. longis 1–2-capitulatis; capitulis ca. 50-floris 1 cm. altis 12 mm. diametro; involucri squamis ca. 20 subaequilongis eroso-ciliolatis, extimis ovato-ellipticis apice rotundatis dorso puberulis vix nervatis subherbaceis ca. 6.5 mm. longis ca. 3 mm. latis, intermediis anguste oblongis obtusis subscariosis 2-nervatis 7.5 mm. longis 2 mm. latis, intimis oblanceolato-linearibus subacutis 1-nervatis 8 mm. longis 1 mm. latis; receptaculo paullo convexo nudo; corollis glabris ca. 5 mm. longis roseis; tubo proprio 1 mm. longo; faucibus cylindratis 3.5 mm. longis; dentibus limbi deltoideis 0.6 mm. longis; antheris distincte ad apicem appendiculatis; achaeniis pallidis deorsum decrescentibus 2.5 mm. longis in angulis hispidis; pappi setis ca. 30 inaequalibus corolla fere dimidio brevioribus paullo barbellatis.—PERU: on grassy hills near Quiaca, Prov. Carabaya, June to July., 1848, *H. Algernon Weddell*, no. 4654 (TYPE, Par., phot. and small fragm. Gr.).

This species has much the habit of *E. scopulorum* Wedd. which however has smaller heads, narrower acutish more distinctly nerved phyllaries, impunctate leaves, a longer proper tube of the corolla and a pappus nearly equalling the corolla. The related *E. Funckii* Robinson of Colombia has 80-flowered heads, acute phyllaries and hexagonal stems.

E. (§ **Eximbricata**) **xanthochlorum**, spec. nov., ut videtur herbaceum erectum perenne 5 dm. vel ultra altitudine basi ignota; caule tereti purpurascenti obscure adpresseque puberulo albo-medulloso 4 mm. diametro; internodiis usque ad 1 dm. longis; foliis oppositis graciliter petiolatis rhombeo-ovatis acuminatis acute et grosse serratis basi cuneatis basin versus integris ima a basi 3–5-nervatis flavido-viridibus pellucido-reticulatis et -puncticulatis vix concoloribus supra minute praecipue secundum nervos sulcatos adpresse hirtellis et cum venulis impressis reticulatis subtus adpresse hirtellis plerumque

6–10 cm. longis 3–5 cm. latis textura firmius membranaceis; petiolo 2–4 cm. longo; corymbis terminalibus compositis densis multicapitulatis planiusculis vel modice convexis 14–22 cm. diametro breviter subadpresse pubescentibus; pedicellis gracilibus plerisque 3–8 mm. longis; capitulis ca. 55-floris ca. 5 mm. altis et latis; involucri squamis ca. 20 lanceolato-oblongis acutis vel acutiusculis plerisque subaequalibus pallide flavido-viridibus dorso dense pubescentibus plerisque 2-costulatis ca. 3.5 mm. longis, extimis 2–3 lanceolatis multo minoribus acuminatis; corollis albis glabris; tubo proprio gracili 1.7 mm. longo; faucibus cylindratis distincte ampliatis 1.2 mm. longis; dentibus limbi deltoideis 0.3 mm. longis; achaeniis maturitate nigris basi pallide callosis 1.3 mm. longis glabris; pappi setis ca. 12 delicatule capillaribus deciduis.—MEXICO: State of Chiapas: on moist rocks in ravines of mountains west of Monserrate, March, 1925, *Dr. C. A. Purpus*, no. 74 (TYPE, in U. S. Nat. Herb. and Gray Herb.); on rocks in mountain streams, Monserrate, April, 1925, *Purpus*, no. 10,074 (U. S., Gr.); on rocks in creeks near Monserrate, April, 1925, *Purpus*, no. 176 (U. S., Gr.).

This species shows most resemblance to *E. pazcuarense* HBK. and *E. photinum* Robinson, but may be readily distinguished from them by its yellowish green color, slightly firmer leaves with coarse and sharper serration, depressed veinlets and clear translucent punctation. The fact that it was obtained several times by Dr. Purpus would suggest that it must be fairly abundant locally, though not apparently collected by previous explorers of Chiapas.

SPANIOPAPPUS, gen. nov. *Compositarum-Eupatoriearum*. Capitula homogama tubiflora. Involucrum campanulatum; squamis subaequalibus 2–3-seriatim imbricatis subherbaceis. Receptaculum modice convexum nudum. Corollae regulares aequales, tubo gradatim paullo ampliato sine faucibus distinctis, limbo 5-dentato. Antherae basi inappendiculatae rotundatae apice cum appendice majuscula ovata hyalina ornatae. Styli rami longissimi filiformes vix apicem versus paullo clavellati. Achaenia anguste prismatica 5-angulata 5-costata. Pappus plerumque e seto unico elongato capillari erecto cum setulis paucis brevissimis patentibus compositus, rarius e setis 2–3 inaequalibus plus minusve elongatis et setulis brevissimis obscuris.—Herba glabriuscula ageratoidea. Folia opposita (superne reducta et alterna) ovata, breviter petiolata. Capitula corymbosa.

S. Ekmanii, spec. nov., perennis herbaceus decumbens 2–3 dm. altus; caule simplici costato-angulato usque ad 4 mm. diametro

juventate obscure hirtello (capillis moniliformibus atropurpureis incurvis gracillimis) tardius glabrato in media parte dense folioso supra nudiusculo; internodiis plerisque 5–8 (rariter ad 35) mm. longis; foliis oppositis breviter petiolatis oblongo-ovatis obtusis crenatis basi cuneatis subcarnosis pinnatim 5-nervatis utrinque viridibus et glabris pellucide punctatis et venulosis 3.5–6.8 cm. longis 2–3 cm. latis; petiolo 2–4 mm. longo obcompresso latiusculo; foliis superioribus paucis (2–4) multo minoribus bracteiformibus alternis; corymbo terminali planiusculo 3–10-capitulato 3–6 cm. diametro; capitulis 50–70-floris 10 mm. altis 14 mm. diametro; involucri campanulati squamis ca. 25–30 subaequalibus lanceolato-oblongis obtusis apicem versus eroso-ciliolatis crassiusculis ca. 5 mm. longis et 2–2.3 mm. latis obscure 3-nervatis; corollis glabris tubulatis 5 mm. longis sursum paullo ampliatis limbi dentibus deltoideis; achaeniis pentagonis 5-costatis olivaceis glabris 3.5 mm. longis in costis multo pallidioribus; pappi setis 1–3(–4) valde inaequalibus 1–2 mm. longis capillaribus erectis albis vix scabratis; setulis pluribus intermediis patentioribus vix 0.1–0.2 mm. longis etiam capillaribus nec squamiformibus.—CUBA: Province Oriente: rare, in very dense low woods at top of the mountain spur El Yungue near Baracoa, *Ekman*, no. 3975 (TYPE, in Gray Herb.).

This plant differs from *Eupatorium* in its pappus, which is reduced to 1–3 or rarely 4 unequal short erect bristles (opposite, i. e. above, the angles of the achenes) and several intermediate setules very much shorter and more spreading. The presence of this rather striking, even if sparse pappus, seems to show that this is not a casual calvous phase of some normally pappus-bearing plant.

From *Ageratum* the present plant may be distinguished by its terete pappus-bristles, which fail to take on the scale-like nature or expanded base characteristic of the pappus in *Ageratum*. Nor has the present plant the strongly ribbed phyllaries, which are prevalent in *Ageratum*.

Its capillary non-plumose pappus, consisting of very unequal bristles, would suggest possible affinity between *Spaniopappus* and the Brazilian *Dyssothrix* or the Mexican and Central American *Fleischmannia*, but its habit does not approach either of these genera. Furthermore its sparse pappus does not agree with the relatively dense and decidedly bivalent pappus of *Dyssothrix* nor the longer and definitely 5-setose pappus of *Fleischmannia*. The inclusion of the present plant in any one of these older genera would much increase the difficulty of keying them. It therefore seems best to give the

plant independent generic standing. It has a fairly characteristic habit and seems to be a shy denizen of an exceptionally secluded habitat, where discovered by Dr. E. L. Ekman whose name it is a pleasure to associate with this rare and interesting Cuban endemic—one of many brought to scientific knowledge by his patient and effective explorations. The generic name is, of course, from σπάνιος *scanty*, and πάππος, *coma*.

Mikania Aschersonii Hieron. in Engl. Bot. Jahrb. xxviii. 577 (1901); Robinson, Contrib. Gray Herb. n. ser. lxiv. 45 (1922). This species has been hitherto known only from the type collection in the Cordillera Occidental near Popayan, Colombia, *Lehmann*, no. 5979. Specimens, seemingly conspecific, have now been received from Peru as follows: wet sunny thicket; fls. dirty white, aromatic, Yanano, alt. 1830 m., *Macbride*, no. 3775 (Field Mus., Gr.); fls. yellowish green, not fragrant, Huacachi, estacion near Muña, alt. 1980 m., *Macbride*, no. 4151 (Field Mus., Gr.); wet rocky uplands, Tambo de Vaca, alt. 3965 m., *Macbride*, no. 4906 (Field Mus., Gr.). In foliage, inflorescence, dark punctation, nature of pubescence, exact proportions of corolla, and many other traits the correspondence between the Colombian type and this newly observed Peruvian material is exceedingly close. In a single point a difference has been observed. In the Colombian plant the pappus is of a reddish or salmon tinge, in the Peruvian, a dirty yellowish white. This may, at least to some extent, be due to the age of the specimens. It is a well known fact that pappus in herbarium specimens may with age turn to much deeper tones than when first dried.

This extension in the range of *M. Aschersonii* is noteworthy and of an unusual kind. The species has not thus far been recorded from Ecuador, but is now to be expected in that country.

In Mr. Macbride's second Peruvian collection there is also a closely related plant, agreeing with *M. Aschersonii* in all important features, but possessing denticulate leaves and having longer and very much more copious pubescence. This may be put on record as follows:

Var. **induta**, var. nov., caule dense patenterque subsetuloso-tomentello; indumento (fide Macbridei) rubro; foliis distincte cuspidato-denticulatis supra crispe puberulis subtus pallide (post exsiccationem) tomentellis; aliter var. **typicae** (cum caule obscure glanduloso-puberulo et foliis integerrimis) similis.—Peru: Dept. Junin: on sunny brush; flowers pale green; pubescence red; La Merced, Hacienda Schunke, about 1220 m. alt., Aug. 27–Sept. 1, 1923, *J. Francis Macbride*, no. 5777 (type, in Field Mus., isotype Gr.).

M. (§ **Thyrsigera**) **brunnescens**, spec. nov., fruticosa volubilis; caulibus perflexuosis subteretibus multi-costulatis 2–3 mm. vel ultra diametro brunnescenti-purpurascentibus crispe puberulis vel patenter villosulis maturitate subglabratis; foliis oppositis breviter petiolatis lanceolato-oblongis integris vel obsolete undulato-dentatis acuminatis basi acutis supra in costa obscure puberulis aliter glabris lucidis post exsiccationem olivaceis vel brunnescentibus subtus paullo pallidioribus obscuris laxe praecipue in costa et nervis brunnescente pubescentibus 5–6 cm. longis 15–24 cm. latis subcoriaceis paullo supra basin pinnatim 5-nervatis, nervis venisque supra immersis et subtus exsertis; paniculis elongatis compositis, partialibus primo subcylindricis densis deinde laxioribus graciliter conicis; capitulis glomeratis breviter pedicellatis statu juvenili ca. 6 mm. longis; pedicellis (valde immaturis) usque ad 2 mm. longis; bracteolis ovatis obtusis vel saepe acutis ca. 3–4 mm. longis et 2 mm. latis; involucri squamis 4.7–5 mm. longis ca. 1.8 mm. latis oblongis obtusis brunnescenti-stramineis, exterioribus paullo pubescentibus, interioribus subglabris sed apicem versus obscure puberulis et ciliolatis; corollae tubo brevi ca. 0.7 mm. longo, faucibus turbinatis, dentibus lanceolatis ca. 1.3 mm. longis; achaeniis nimium immaturis ut videtur glabriusculis; pappi setis ca. 50 pallide roseo-salmoneis.—*M. laevis* Glaziou, Bull. Soc. Bot. Fr. lvi. Mém. 3, 392 (1909), in part, not DC.—Brazil: *Burchell*, no. 4774 (type, in Gray Herb.); also at Barbacena and Caraca, Minas Geraes, *A. Glaziou*, no. 15,129 (Copenh., fragm. Gr.).

Traced by Baker's key of the Brazilian Mikanias, this plant falls near *M. Candolleana* Gardn., for, like that species, it has ecordate, lance-oblong leaves, pubescent beneath, and phyllaries 4.7–5 mm. long (even when immature), therefore over 2 lines in length. From *M. Candolleana* the plant here described differs in its smaller, much thicker leaves, lucid on their upper surface, in its smaller heads, denser and more irregular inflorescence, and in its salmon-pinkish not white pappus-bristles. *M. laevis* DC., to which Glaziou, l. c., referred his no. 15,129, is a later name for *M. trinervis* Hook. & Arn., a species with much larger, ovate, glabrous leaves, and looser panicles, more slender heads and relatively longer pedicels, etc.

It is to be regretted that neither the specimen of Burchell nor that of Glaziou shows the mature florets, but the distinctness of the species seems assured by the other characters clearly shown and it may therefore be put on record. It is also regrettable that Glaziou in his list has repeated, probably by clerical or typographical error, the no. 15,129, citing it also on page 396 as *M. ligustrifolia* DC., with which, of course, this plant has no connection.

M. (§ **Thyrsigera**) **caldasana**, spec. nov., fruticosa scandens; caule tereti post exsiccationem leviter costulato usque ad 6 mm. diametro albo-medulloso fulvo-tomentello; internodiis plerisque 5–7 cm. longis; foliis ovatis obtusis mucronulatis integris vel obscure remoteque cuspidato-denticulatis basi rotundatis pinnatim 5(–7)-nervatis untrinque viridibus supra scabris et in nervis dense fulvo-tomentellis subtus paullo pallidioribus hispidulis impunctatis in nervis etiam fulvo-tomentellis 7–9.5 cm. longis 5–7 cm. latis membranaceis; venulis supra impressis subtus modice exsertis; petiolis 2–2.5 cm. longis teretibus fulvo-tomentellis; eis ejusdem jugi inter se ab annulo transverso paullo incrassato sed exappendiculato conjunctis; panicula thyrsiformi 1.5 dm. longa ca. 8 cm. diametro ovoidea densa; capitulis sessilibus ca. 1 cm. longis in glomerulos sphaericos aggregatis; bracteolis lanceolatis ca. 4 mm. longis; involucri squamis oblongo-linearibus 7–8 mm. longis 1–1.5 mm. latis obtusis brunneis dorso breviter hispidulis; corollis flavido-albis ca. 5 mm. longis obscure granulatis; tubo proprio 1.8 mm. longo gracili; faucibus turbinato-subcampanulatis ca. 2.7 mm. longis; dentibus limbi deltoideis 0.5 mm. longis; achaeniis gracilibus nigris minute glanduliferis 5 mm. longis vix 0.5 mm. diametro; pappi setis ca. 35 albidis laeviusculis 4–4.5 mm. longis.—COLOMBIA: Department of Caldas: climbing shrub in edge of forest, alt. 3100–3400 m., "Alaska," above Salento, Cordillera Central, Aug. 7, 1922, *Dr. Francis W. Pennell*, no. 9364 (TYPE, in Gray Herb.).

In some respects this species would seem to stand near the still imperfectly known *M. multinervia* Turcz. and has the same tendency to a glomerate arrangement of its heads in the thyrse. However, *M. multinervia* is a smooth plant, with elliptical and serrate, rather than ovate and subentire leaves. Its phyllaries are ovate-oblong instead of almost linear as in the present species. *M. caldasana* is probably even more nearly related to *M. Aristei* Robinson, but differs in its somewhat larger, more ovate, nearly entire and somewhat more distinctly reticulated leaves, its more spherical glomerules of heads in the denser thyrse, fulvous, shorter, and denser indument, and narrower phyllaries.

M. (§ **Thyrsigera**) **caustolepis**, spec. nov., fruticosa scandens sordide pubescens et minute nigro-papillata; caule tereti multicostulato fusco 4 mm. vel ultra diametro dense incurvo-puberulis et dense nigro-pustulato albo-medulloso; internodiis ad 1.5 dm. longis; foliis oppositis petiolatis ovatis acutis integris basi rotundatis pinnatim 7–9-nervatis textura membranaceis utrinque viridibus et

dense nigro-atomiferis supra hirtellis subtus in nervis pubescentibus 6–7 cm. longis 4–4.5 cm. latis; nervis et venulis subtus leviter prominulentibus; petiolo 1.5–2 cm. longo; panicula magna pyramidata foliaceo-bracteata terminali 5 dm. alta et 3 dm. crassa; ramis divaricatis; capitulis (immaturis) ca. 5–6 mm. longis breviter pedicellatis ad apices ramulorum aggregatis; bracteolis oblongis ca. 2 mm. longis ad vel prope apicem pedicelli affixis; involucri squamis oblongis viridibus 7–9-striatulo-costulatis dorso glabriusculis apice rotundatis apicem versus prope marginem nigro-glandulosis quasi ustis; corollis albis glabris ca. 4 mm. longis (immaturis); tubo ca. 1.5 mm. longo; faucibus 1 mm. longis; dentibus limbi lanceolatis acutis 1.5 mm. longis et 0.6 mm. basi latis; achaeniis (immaturis) ca. 1.5 mm. longis; pappi setis ca. 36 sursum scabratis et paullo incrassatis albis corollam subaequantibus.—PERU: Dept. Cuzco: climbing white-flowered shrub in forest near Rio Yanamayo, below "Pillahuata," alt. 2000–2300 m., May 4–5, 1925, *Pennell*, no. 14,070 (TYPE, in Gray Herb.).

The available material of this species, though immature and not showing the leaves below the large inflorescence, is still so clearly different from any previously known species as to justify characterization and published record. The nervation of the leaves is about intermediate between the conditions usually described as pinnate-nerved and pinnate-veined. The species may be placed near *M. trachodes* Robinson, though clearly distinct from it, having dark-punctate leaves of much thinner texture and much less hairy above, very different phyllaries, etc. The name *caustolepis* alludes, of course, to the dark glandular margin of the phyllaries which gives them a scorched or singed appearance.

M. (§ GLOBOSAE) DESMOCEPHALA Robinson, Contrib. Gray Herb. n. s. lxiv. 7 (1922). This well marked species was originally described from Bolivian material. However in Mr. Macbride's second Peruvian collection there is a specimen which corresponds closely with the original Bolivian material in all details of inflorescence, involucre, corolla, and achenes, but differs noticeably in the form, texture and surface of the leaves, seeming therefore to warrant varietal separation as follows:

Var. **typica**, caule minute granulato; foliis membranaceis opacis supra minute papillosis subtus parce pubentibus.—*M. desmocephala* Robinson, l. c.—BOLIVIA: Province Yungas, *Rusby*, no. 1740, and in woods, San Carlos, near Mapiri, *Buchtien*, no. 1550.

Var. **peruviana**, var. nov., caule patenter setuloso-tomentello (indumento juvenili fide Macbridei subroseato sed post exsiccationem

fuscescenti); foliis maturiate chartaceo-subcoriaceis supra lucidis rugosis depresse puncticulatis subtus ut apud var. *typicam*.—PERU: Dept. Junin: on sunny brush, La Merced, Hacienda Schunke, alt. 1220 m., Aug. 27–Sept. 1, 1923, *J. Francis Macbride*, no. 5776 (TYPE, Field Mus., isotype Gr.).

Until much more material is available, both from Bolivia and Peru, the classificatory value of the differences here indicated must remain doubtful. They may prove specific or, on the other hand, merely formal. However, the two plants, rather widely separated geographically and showing such distinctions, should scarcely be merged without comment.

M. GLOBULIFERA Rusby ex Robinson, Contrib. Gray Herb. n. s. lxi. 15 (1920); lxiv. 50 (1922). An inflorescence closely simulating that of this species was collected by Mr. E. P. Killip in a forest at "La Gallera," Micay Valley, Department of El Cauca, in the Cordillera Occidental of Colombia, alt. 1800–1900 m., July 1, 1922, no. 7917 (Gr.). Unfortunately no attached foliage was secured and there was associated with the inflorescence a stem bearing alternate ovate leaves and doubtless belonging to some quite different plant, possibly a *Tournefortia*. Determined from inflorescence alone, the identification of the *Mikania* is subject to some doubt, especially as the only previously known station for this species was in the widely removed region of Santa Marta and at considerably lower altitude.

M. (§ **Thyrsigera**) **granulata**, spec. nov., herbacea vel fruticosa scandens hirtella vel glabriuscula; caule tereti post exsiccationem costulato purpureo fistuloso usque ad 4 mm. vel ultra diametro oppositirameo; foliis oppositis petiolatis ovatis acuminatis obscure remoteque cuspidato-denticulatis basi saepius rotundatis aliquando subcordatis vel obtusis firmiuscule membranaceis utrinque viridibus et (sub lente) granulato-scabratis supra basin pinnatim 5(–7)-nervatis usque ad 7 cm. longis et 5 cm. latis pellucide reticulato-venosis; petiolis gracilibus flexuosis subteretibus supra sulcatis 1–2 cm. longis; paniculis thysoideis compositis basi foliaceo-bracteatis ad 4 dm. longis et 2 dm. crassis; capitulis ca. 1 cm. longis sessilibus plerumque trinis ad apices paniculae ramulorum et in jugo unico paullo infra in quoque ramulo dispositis; bracteolis lanceolato-linearibus acutis ca. 2 mm. longis; involucri squamis oblongo-linearibus brunneis ca. 6 mm. longis apicem obtusum vel rotundatum versus tenuioribus ciliolatis dorso paullo pubentibus vix nervatis; corollis albis glabris ca. 4 mm. longis; tubo proprio 1.5 mm. longo gracili; faucibus subturbinato-campanulatis ca. 2 mm. longis; dentibus limbi deltoideis

0.5 mm. longis; achaeniis gracilibus atrobrunneis 5 mm. longis in summa parte et in costis parce pubentibus; pappi setis ca. 40 brunnescenti-albis apicem versus paullo incrassatis.—COLOMBIA: Department of El Cauca: in forest at "Canaan," Mt. Purace, Cordillera Central, alt. 3100–3300 m., June 11–13, 1922, *Pennell & Killip*, no. 6626 (TYPE, in Gray Herb., isotype Acad. Philad.); also in field at same locality, no. 6499 (Gr.).

This species differs from *M. Stuebelii* Hieron. conspicuously in the form and texture of its leaves, which examined under a lens can be seen to be roughened by a slight granulation on both surfaces. The species also bears in its inflorescence much resemblance to *M. Jamesonii* Robinson of Ecuador, but that has much more deeply and regularly dentate leaves of slightly different form.

Two varieties of *M. granulata*, seemingly referable to a single species, may here be recognized, thus:

Var. **typica**, foliis praecipue subtus in costa pubescentibus margine distincte sed remote cuspidato-denticulatis textura membranaceis vel submembranaceis; petiolis puberulis.—Exsiccatae as above stated.

Var. **integra**, var. nov., foliis etiam in costa glabris margine integris textura subchartaceis; petiolis glabris.—COLOMBIA: Department of Caldas: climbing shrub in forest, at "Pinares," above Salento, alt. 2600–2800 m., Aug. 2–10, 1922, *Francis W. Pennell*, no. 9308 (TYPE, in Gray Herb., isotype Acad. Philad.).

In both varieties the pubescence seems remarkably inconstant on axes of different orders even in the same individual. Thus at a given node in the panicle the lateral branches may become decidedly pubescent, while the central axis remains quite glabrous, or all may at a given node become pubescent. In no. 6626 a portion of a main stem is for a distance of 2 or 3 cm. above a node almost shaggy, being covered by coarse spreading trichomes 1–2 mm. in length, while the lateral axes on the same individual are essentially smooth above the nodes.

M. (§ **Thyrsigera**) **hylibates**, spec. nov., fruticosa grandis scandens (inflorescentia sordide breviter puberula excepta) glaberrima; caulibus viridibus costulato-subangulatis; internodiis plerumque 7–8 cm. longis; foliis oppositis petiolatis oblongis longe acuminatis integris basi breviter acutatis vel rotundatis saepe subobliquis supra viridibus subtus paullo pallidioribus fusco-punctulatis a basi 3(–5)-nervatis coriaceis 7–11.5 cm. longis 3–5 cm. latis; petiolis ut videtur prehensilibus supra sulcatis ca. 4 cm. longis; paniculis lateralibus et

terminalibus conjunctim inflorescentiam elongatam foliaceo-bracteatam formantibus; capitulis (paullo immaturis) 8 mm. longis; sessilibus plerumque oppositis vel terminalibus; bracteolis oblongis herbaceis 2.5 mm. longis; involucri squamis oblongis obtusis pallido-brunneis vix nervatis apicem versus dorso puberulis ca. 4.5 mm. longis 1–1.5 mm. latis; corollis (immaturis) glabris albis 5.5 mm. longis tubulatis apicem versus paullo ampliatis; achaeniis valde immaturis 2 mm. longis; pappi setis ca. 40 sordide albis corollam subaequantibus vix scabratis.—COSTA RICA: large woody vine in wet forest; leaves thick; flowers white, El Muñeco, south of Navarro, Province of Cartago, alt. about 1400 m., Feb. 8, 9, 1924, *Paul C. Standley*, no. 33,848 (TYPE, U. S., phot. and fragm. Gr.). A species very close to the Brazilian *M. laevigata* Sch.-Bip., which, however, to judge from Dusén's no. 15,607 has leaves nerved from somewhat above the base, a denser panicle, somewhat smaller heads and relatively shorter bractlets. In the presence of these differences and its wide geographic separation it seems best to treat this Costa Rican plant as an independent species.

M. (§ **Spiciformes**) **Killipii**, spec. nov., fruticosa scandens; caule tereti juventate obscure crispeque puberulo purpurascenti vel in uno latere violascenti-brunnescenti; foliis oppositis graciliter petiolatis ovatis acuminatis integris basi obtusis vel rotundatis utrinque laete viridibus glabris subtus minute nigro-puncticulatis supra basin 3(–5)-nervatis 6–8 cm. longis 3.5–4.5 cm. latis textura tenuiter membranaceis; petiolo 2.5–3 cm. longo; appendicibus interpetiolaribus lunulatis usque ad 4 mm. longis laceratis brunnescentibus; panicula terminali composita 3–4 dm. longa 2–3 dm. crassa foliaceo-bracteata crispe puberula; spicis plerisque 3–6 cm. longis 1.5–2 cm. crassis; capitulis patenter subadscendentibus ca. 12 mm. longis sessilibus; bracteolis subulati-linearibus ca. 2 mm. longis; involucri squamis oblanceolato-oblongis viridibus tenuibus obtusis vel subacutis apicem versus eroso-serrulatis et obscure puberulis aliter glabris obscure nervatis basi calloso-subgibbosis 8 mm. longis 2 mm. latis; corollis viridescenti-albis; tubo gracili curvato glabro ca. 5 mm. longo; faucibus vix ullis; lobulis limbi oblongis subacutis patentibus ca. 1.7 mm. longis; achaeniis (immaturis) subglabris 4 mm. longis; pappi setis ca. 110 pallide salmoneis 5–6 mm. longis capillaribus laeviusculis.—COLOMBIA: Department of El Cauca: thicket along stream, at Coconuco in the Cordillera Central, alt. 2300–2500 m., June 17–18, 1922, *Ellsworth P. Killip*, no. 6823 (TYPE, in Gray Herb., isotype in herb. of Phil. Acad. Nat. Sci.).

This species is obviously more nearly related to *M. bogotensis* Benth. than to any of the other Mikanias of Colombia, but differs in having heads, florets, and achenes about twice as large, its leaves (so far as shown) are not cordate and they are somewhat more obviously dark-punctate beneath. Furthermore, the forking of the midnerve occurs in *M. bogotensis* at the very base of the leaf, while in the species here characterized, the midnerve (after giving off near the base one or two minor lateral branches) itself divides into three nerves at a point 4–5 mm. above the base.

It is a pleasure to commemorate in the name of this species the effective tropical exploration of its collector.

M. (§ **Spiciformes**) **micayensis**, spec. nov., fruticosa volubilis glabriuscula; caule subtereti post exsiccationem costulato brunneo 2–3 mm. vel ultra diametro albo-medulloso; internodiis usque ad 2 dm. longis; foliis oppositis petiolatis late ovatis vel obovatis apice rotundatis vel breviter subacuminatis integris basi obtusis vel acutiusculis 5.5–10 cm. longis 3–9 cm. latis supra (post exsiccationem) atrobrunneis glabris subtus multo pallidioribus brunneo-griseis puncticulatis pinnatim 5(–7)-nervatis textura firmiter coriaceis; nervis supra sulcatis subtus prominentibus prorsum incurvis et inter se anastomosantibus; venulis utrinque prominulentibus reticulatis; areolis saepius plus minusve protractis; petiolo crasso supra leviter sulcato; appendicibus stipuliformibus lunulatis ca. 1 mm. altis suberosis; panicula terminali obsolete puberula ad 4 dm. longa 1 dm. crassa basin versus foliaceo-bracteata sursum nudiuscula; spicis 1–4 cm. longis multicapitulatis; capitulis ca. 5 mm. longis arcte sessilibus; bracteolis ovatis vel lanceolatis ca. 1.2 mm. longis; involucri squamis anguste oblongis apice rotundatis puberulis 3 mm. longis; corollis glabris; tubo proprio gracili 1.5 mm. longo; faucibus turbinatis paullo atomiferis 1 mm. longis; dentibus limbi anguste deltoideis acutiusculis ca. 0.7 mm. longis; achaeniis 1.8 mm. longis atrobrunneis obscure glandulari-atomiferis; costis pallidioribus; pappi setis ca. 40 substramineis corollam aequantibus apicem versus paullulo incrassatis, —COLOMBIA: Department of El Cauca: a climbing shrub in clearing, "La Gallera," Micay Valley of the Cordillera Occidental, alt. 1500–1800 m., July 1, 1922, *Ellsworth P. Killip*, no. 7894 (TYPE, in Gray Herb.).

This species is most nearly related to *M. leiostachya* Benth., but has leaves which are obtuse or rounded instead of sharply acuminate at tip, of somewhat firmer texture, more discolorous, and reticulated in a somewhat different manner, the areolae being more elongated

and the transverse veins between the nerves being much less definite and regular.

M. (§ **Thyrsigerae**) **Millei**, spec. nov., fruticosa robusta volubilis in inflorescentia brunnescenti-tomentella aliter glabra vel glabriuscula; caule subtereti post exsiccationem multicostulato fistuloso ca. 4–5 mm. diametro; foliis oppositis petiolatis late ellipticis integris vel paullo undulato-subdenticulatis margine revolutis apice et basi rotundatis utrinque glabris et leviter reticulatis supra sublucidis subtus distincte pallidioribus opacis supra basin pinnatim 7-nervatis textura rigidiuscule coriaceis 6–8 cm. longis 4–5 cm. latis; nervis subtus valde prominentibus supra sulcatis a venis multis transverse conjunctis; petiolis robustis supra sulcatis plerisque 1–1.6 cm. longis, eis ejusdem jugi ab annulo (vel ala brevissima) primo tenui deinde paullo suberoso transverse conjunctis; internodiis 5–7 cm. longis; inflorescentiis terminalibus et caulis apicem versus lateralibus convexis densis conjunctim paniculam ovoideam vel etiam planiusculam formantibus; capitulis ca. 8.5 mm. longis sessilibus congestis; bracteolis lanceolatis sessilibus ca. 5.5 mm. longis attenuatis acutis 3–5-costatis; involucri squamis anguste oblongis apice rotundatis dorso convexis atrobrunneis ecostatis ca. 6.5 mm. longis et 1.5 mm. latis praecipue basin versus tomentellis vel lanceolatis; corollis glabris; tubo proprio gracili 2 mm. longo; faucibus cylindratis paullo ampliatis ca. 3 mm. longis; dentibus limbi anguste deltoideis acutis ca. 1 mm. longis et 0.5 mm. latis; achaeniis (juvenilibus) 2.4 mm. longis; pappi setis ca. 30 salmoneo-albidis ca. 5.5 mm. longis sursum paullulo incrassatis laevibus.—ECUADOR: in silvis subandinis ad Tambillo alt. 3200 m., Aug., 1917, *Father Luis Mille*, no. 525 (TYPE, in Gray Herb.).

This species with its densely clustered heads, sometimes in rather flattish inflorescences, forms a transition between § § *Thyrsigerae* and *Corymbosae*, but on the whole appears more naturally placed in the former. It is a pleasure to dedicate this well marked plant to its discoverer, the *Rev. Father Luis Mille*, S. J., whose patient observation and discriminating collecting have done much to aid in the elucidation of the difficult flora of Ecuador. According to Father Mille it bears in the region of Tambillo the vernacular name of "Poroto Angu."

M. (§ **Thyrsigera**) **mucronulifera**, spec. nov., herbacea perennis scandens patenter brunneo-pubescens; caule tereti gracili purpureo-brunneo post exsiccationem pluricostulato fistuloso ca. 3 mm. diametro; internodiis 5–18 cm. longis; foliis oppositis graciliter petiolatis rhombeo-ovatis obtuse acuminatis et breviter mucronulatis utroque

supra mediam partem minute 2–3-cuspidato-denticulatis (dentibus ca. 0.5 mm. longis 6–8 mm. inter se distantibus) basi integris cuneatis membranaceis post exsiccationem atrobrunneis supra basin pinnatim 5-nervatis ciliolatis et utrinque sordide pubescentibus ca. 6 cm. longis et 3–4 cm. latis; petiolis 8–12 mm. longis dense pubescentibus; eis ejusdem jugi ab annulo vix incrassato inappendiculato conjunctis; paniculis terminalibus sublaxis ca. 2 dm. altis et crassis, ramis curvato-adscendentibus vel divaricatis; capitulis 8–9 mm. longis plerisque ternis in apices ramulorum sessilibus; bracteolis linearibus acutis ca. 2 mm. longis; involucri squamis linearibus brunneis apicem versus paullo angustatis tenuioribus eroso-ciliatis in apicem verum rotundatis ca. 6 mm. longis 1.3 mm. latis apicem versus paullo dorso puberulis; corollis albis ca. 4 mm. longis; tubo proprio 1 mm. longo; faucibus turbinato-campanulatis ca. 2.5 mm. altis et 1.7 mm. latis; dentibus limbi deltoideis ca. 0.5 mm. longis; antheris apice modice appendiculatis; achaeniis gracilibus maturitate nigrescentibus sublaevibus 3.5–3.8 mm. longis vix 0.7 mm. crassis; pappi setis ca. 40 brunnescenti-albis ca. 4 mm. longis apicem versus distincte incrassatis scabratis.—COLOMBIA: Department of El Cauca: open land, near Rio San Joaquin, at "La Gallera," Micay Valley, alt. 1400–1500 m., in the Cordillera Occidental, June 29–30, 1922, *Ellsworth P. Killip*, no. 7858 (TYPE, in Gray Herb.).

This species is probably nearest *M. Stuebelii* Hieron., but differs in its rather copious dark and spreading pubescence and essentially membranaceous leaves which are distinctly mucronulate at the tip.

M. NIGROPUNCTULATA Hieron. in Engl. Bot. Jahrb. xxviii. 578 (1901). When revising the Mikanias of Colombia some years ago, the writer (Contrib. Gray Herb. n. s. lxiv. 44), having seen no material of this species, was obliged to interpret it from the original diagnosis. This was happily pretty full and well drawn, but in one respect misleading, since it suggested that the species belonged in the corymbose section of the genus. Some years later the writer was able to obtain, through the kindness of Prof. Diels, Director of the Botanical Garden and Museum at Berlin-Dahlem, a photograph of the type and there has been recently received at the Gray Herbarium from the Royal Gardens at Kew, in continuation of exchange, an isotype of the species, namely Lehmann's no. 5964, collected in the Cordillera Occidental near Popayan at 1200–1800 m. These sources of information show clearly that the species does not belong in § *Corymbosae* (as interpreted by the writer), but in § *Thyrsigerae*, with thyrsoid-paniculate and only very obscurely if at all corymbose inflorescence.

The extensive collections of Dr. Pennell's party which visited the Andes of Popayan in 1922, contain no specimen precisely matching Lehmann's type of *M. nigropunctulata*, but include three numbers, also from the Cordillera Occidental (though obtained at a somewhat greater altitude) which differ somewhat in leaf-breadth, leaf-texture, and length of petiole, but agree with *M. nigropunctulata* in all essential floral and achenial characters, and show also so many close similarities in nervation, pubescence, punctation, etc., as to leave little doubt that they represent mere varieties of a somewhat variable species. The plants in question may be treated as follows:

M. NIGROPUNCTULATA Hieron., var. **typica**, foliis ovatis usque ad 15 cm. longis et 7 cm. latis integris subchartaceis; petiolis modice gracilibus usque ad 2 cm. longis,—*M. nigropunctulata* Hieron. l. c.

Var. **cryptodonta**, var. nov., foliis lanceolato-oblongis ca. 12 cm. longis et 4–4.5 cm. latis obscure obsoleteque calloso-denticulatis; petiolis robustioribus 4–8(–10) mm. longis.—COLOMBIA: Department El Cauca: climbing shrub in glen of forest, alt. 2400–2700 m., "San José," San Antonio, in the Cordillera Occidental, June 28, 1922, *Pennell & Killip*, no. 7342 (TYPE, in Gray Herb.); also no. 7314 (Gr.) secured the same day on a bushy slope at the same locality. The presence of teeth on the leaf-margins can be detected only by examination with a lens.

Var. **phaenodonta**, var. nov., foliis oblongo-lanceolatis caudato-attenuatis distincte denticulatis (dentibus ca. 0.5 mm. altis et inter se 2–10 mm. distantibus) subchartaceis 12–14 cm. longis 3–4 cm. latis; petiolis vix 4 mm. longis.—COLOMBIA: Department El Cauca: climbing shrub in bushy forest, alt. 2400–2700 m., "San José," San Antonia, June 28, 1922, *Pennell & Killip*, no. 7430 (TYPE, in Gray Herb.).

M. (§ **Thyrsigera**) **nubigena**, spec. nov., suffrutescens scandens inflorescentia puberula excepta omnino glabra; caulibus teretibus 3 mm. vel ultra diametro laevibus albo-medullosis; internodiis usque ad 8 cm. longis; foliis oppositis petiolatis ovato-oblongis caudato-acuminatis basi rotundatis vel plerumque abrupte subacutatis in lateris remote cuspidato-denticulatis pinnatim 5-nervatis utrinque viridibus subconcoloribus reticulatis (venulis utrinque prominulentibus) coriaceis 8–10 cm. longis 3.5–4.7 cm. latis; petiolis 2–2.5 cm. longis glabris supra sulcatis, eis ejusdem jugi ab annulo elevato transverso conjunctis; panicula terminali composita foliaceo-bracteata usque ad 3 dm. longa et 2 dm. diametro laxiuscula sordide in ramulis puberula; capitulis sessilibus plerisque oppositis ca. 7 mm. longis (paullo ante anthesin); involucri squamis anguste oblongis herbaceis apice rotunda-

tis ciliolatis fere enervatis dorso glabris basin versus valde incrassatis callosis pallidis et variolatis; corollis (statu juvenili) 4.5 mm. longis tubulatis vix apicem versus ampliatis; limbi dentibus angustis acutis; achaeniis immaturis 2 mm. longis; pappi setis ca. 30 corollam subaequantibus flavescenti-albis sublaevibus,—COSTA RICA: suffrutescent vine; flowers green, in wet forest, Las Nubes, Province of San José, alt. 1500–1900 m., Mar. 20–22, 1924, *Paul C. Standley*, no. 38,509 (TYPE, U. S., isotype Gr.).

This species, having heads sessile on the branchlets of the panicle, forms a perceptible transition to § *Spiciformes* but its spicate tendency is so slight that the species seems best placed in § *Thyrsigerae*. It has much the habit and many of the characters of the Brazilian *M. laevigata* Sch.-Bip. but that has oblong rather than ovate-oblong, acute rather than caudate-acuminate leaves, shorter petioles, and denser inflorescence. Its involucral scales are similarly callose-thickened at the base but not variolate.

M. (§ **Thyrsigerae**) **pulverulenta** Sodiro in herb., fruticosa scandens sordide puberula vel etiam in inflorescentiis tomentella; caule subtereti pluricostulato 5 mm. vel ultra diametro primo fulvescenti-tomentello deinde subglabrato vel glabrato fistuloso; internodiis 6–14 cm. longis; foliis oppositis petiolatis ellipticis vel lanceolato-oblongis acuminatis integris basi rotundatis margine revolutis textura chartaceis supra praecipue in nervis puberulis sublucidis planis vel paullulo rugulosis subtus pallidioribus prominenter reticulato-venosis supra basin 5(–7)-nervatis minute punctatis vel papillosis et in nervis patenter crispeque pubescentibus 7–10.5 cm. longis 3.4–5 cm. latis; petiolis ca. 1 cm. longis sordide tomentellis, eis ejusdem jugi ab annulo tenui exappendiculato vix prominulenti transverse conjunctis; paniculis pyramidatis in inflorescentiam compositam terminalem usque ad 6 dm. longam foliaceo-bracteatam conjunctis; capitulis sessilibus plerisque ad apices paniculae ramulorum ternatim glomeratis 6–7 mm. longis; involucri squamis subobovati-oblongis apice rotundatis ca. 3 mm. longis et 1 mm. latis viridibus dorso sordide puberulis et granulosis; bracteola lineari-lanceolata ca. 1.3 mm. longa; corollis ca. 5 mm. longis extus puberulis; tubo proprio 1.6 mm. longo; faucibus gradatim paullo ampliatis ca. 2.2 mm. longis; dentibus limbi anguste deltoideis acutis ca. 1 mm. longis; achaeniis nigris deorsum decrescentibus ca. 2 mm. longis glabris lucidis; pappi setis ca. 23 flavescenti-albis apicem versus incrassatis sublaevibus.—ECUADOR: in subandine woods near Tambillo, alt. 2800 m., Aug., 1918, *Father Luis Mille*, no. 524 (TYPE, in Gray Herb.).

This species is certainly close to the Colombian *M. sylvatica* Klatt (of which the Ecuadorian *M. lanceolata* Hieron. may prove a synonym), but *M. sylvatica* (as well as *M. lanceolata*) has narrower, more coriaceous, and much smoother leaves, with less sharply prominulent veins and a somewhat different type of pubescence. In *M. sylvatica* the lower surface of the leaves is sometimes almost glabrous, at others sparingly villous with appressed or subappressed slender straight hairs. In *M. pulverulenta* the lower surface of the leaves, at least upon the nerves and chief veins, is shortly but distinctly shaggy with a fulvous crisped pubescence and also somewhat obscurely granuliferous (whence doubtless the specific name selected by Father Sodiro).

In *M. pulverulenta*, two varieties may be distinguished as follows:

Var. **typica**, foliis ellipticis breviter acuminatis basi rotundatis 1–3 longioribus quam latis subtus subglauco-viridibus in venulis vix puberulis.—Distrib. and exsicc. as stated above.

Var. **lasiophlebia**, var. nov., foliis lanceolato-oblongis caudato-acuminatis ter longioribus quam latis basi plus minusve acutatis subtus flavescenti-viridibus in venulis patenter tomentosis.—ECUADOR: in subandine forests of the Lloa Valley on Mt. Pichincha, alt. 2800 m., 1919, *Father Luis Mille*, no. 526 (TYPE, in Gray Herb.). Notwithstanding the marked foliar differences stated, these plants show such coincidence in inflorescence and many minor characters as to discourage their treatment as independent species. Much more copious material is needed to draw specific lines with confidence in this group.

M. (§ **Thyrsigerae**) **Standleyi**, spec. nov., suffruticosa scandens in exsiccatione nigrescens; caule tereti multi-costulato primo crispe fulvido-puberulo tardius glabrato; internodiis usque ad 14 cm. vel ultra longitudine; foliis oppositis longe petiolatis ovatis acuminatis obsolete cuspidato-denticulatis basi late cordatis sed ad apicem petioli breviter acuminatis supra glabris subtus crispe puberulis ima a basi 3(–5)-nervatis subtus prominulenter reticulatis 8–10 cm. longis 6–7 cm. latis membranaceis; petiolis gracilibus flexuosis similiter prehensilibus 4–5 cm. longis; eis ejusdem jugi basi per annulum prominulum transversum conjunctis; panicula pyramidata magna laxa 4 dm. longa 1.5–2 dm. diametro fulvido-puberula; pedicellis plerisque 4–5 mm. longis; bracteola lanceolata acuminata 2–3 mm. longa in apice pedicelli affixa; involucri squamis 6.5 mm. longis atrobrunneis vix costulatis apicem versus dorso puberulis, exterioribus subacutatis ca. 2 mm. latis, interioribus apice rotundatis 2.5 mm. latis subscareoso-marginatis; corollis albidis ca. 6 mm. longis; tubo

proprio gracili 4 mm. longo glabro; faucibus brevissimis extus puberulis; dentibus limbi ovatis acutis marginatis ca. 2.5 mm. longis et 1.2 mm. latis; antheris longe exsertis; achaeniis glabris deorsum paullo decrescentibus olivaceo-brunneis 4–5 mm. longis; pappi setis ca. 70 ca. 5.5 mm. longis fulvescenti-albidis.—COSTA RICA: in wet forest; flowers dirty white, La Estrella, Province of Cartago, Mar. 26–27, 1924, *Paul C. Standley*, no. 39,155 (U. S., phot. and fragm. Gr.). In some respects recalling the Peruvian *M. incasina* Robinson, but differing in its shorter, broader, relatively longer-petioled leaves, and in its phyllaries which are less modified toward the tip and show no tendency to spread abruptly as in the case of the South American species.

M. (§ **Thyrsigerae**) **stereodes,** spec. nov., fruticosa volubilis; caule tereti multicostulato ca. 4 mm. diametro fulvido-tomentello scabriusculo; medulla flavescenti-alba; internodiis 5–15 cm. longis; ramis patentibus; foliis oppositis breviter petiolatis ovatis acuminatis integris vel obsolete remoteque cuspidato-denticulatis basi obtusis vel subrotundatis supra breviter scabro-pubescentibus tardius (nervis exceptis) subglabratis minutissime reticulato-rugulosis subtus opacis concoloribus appresse pubescentibus minute nigro-puncticulatis prominulenter reticulatis textura rigidiusculis a basi fere ad mediam partem pinnatim 7–9-nervatis 6–10 cm. longis 2.5–6 cm. latis; petiolis 1–1.4 cm. longis flexuosis tomentellis, eis ejusdem jugi leviter annulo inappendiculato transverso conjunctis; paniculis ramos terminantibus ovoideis 6–25 cm. longis 5–10 cm. diametro fulvo-tomentellis patenter ramosis; bracteolis lanceolato-linearibus; pedicellis 0.7–2.8 mm. longis tomentosis; involucri squamis oblongis apice obtusis vel rotundatis 3.5 mm. longis 1 mm. latis, exterioribus dorso dense appresseque pubescentibus ecostatis; interioribus glabriusculis; corollis parce villosulis ca. 4.5 mm. longis; tubo proprio ca. 1 mm. longo; faucibus distincte ampliatis cylindratis ca. 3 mm. longis; dentibus limbi anguste deltoideis ca. 0.7 mm. longis; achaeniis olivaceis laeviusculis ca. 4 mm. longis et 0.8 mm. crassis; pappi setis 23–30 brunnescenti-albis ca. 4 mm. longis.—PERU: Villacabamba, Hacienda on Rio Chinchao, alt. 1830 m., July 17–26, 1923, *Macbride*, no. 5163 (**TYPE, Field Mus., isotype Gr.**).

In many respects near *M. trachodes* Robinson but having longer achenes, and a very different corolla with throat much longer in relation to the proper tube and limb. Furthermore the veinlets in *M. trachodes* are prominulent on the upper surface of the leaves, while in the species here described they are immersed or even somewhat depressed.

KANIMIA POHLII Bak. in Mart. Fl. Bras. vi. pt. 2, 370 (1876). During the examination of material recently lent by the Botanical Museum of Copenhagen for study at the Gray Herbarium, there were found two sheets collected by Warming and provisionally referred to *Mikania*, which proved on comparison to be identical with the little known *Kanimia Pohlii* Bak. Examination of this new material yields a few added characters, which may be put on record. Baker states without qualification that the leaves are opposite, but even in the type (Pohl's no. 536) they are only subopposite, some of the pairs being more or less separated, while in the obviously identical material of Warming, namely his no. 645 and an unnumbered specimen, both from Lagoa Santa, the leaves are practically alternate, those of the same pair being separated often by an interval nearly as long as the distance to the nearest leaf of the next pair. Baker states that the pappus-bristles are 60 or more. A careful count showed them in one floret to be 145. Schultz-Bipontinus, annotating an envelope containing bits of a dissection accompanying Warming's no. 645, stated that the heads are 3-flowered, but they were clearly 4-flowered in a dissection made by the writer. Baker states that there are five involucral scales. Of course one of these is the bractlet which is broadly rhomboid-ovate about 8 mm. long, and 5 mm. wide, while the four phyllaries are elliptic-oblong, about 9 mm. long and 3–4 mm. wide. The corolla-dimensions, not very clearly stated by Baker, are as follows: proper tube 1.5 mm. long, the scarcely differentiated and but slightly enlarged turbinate throat about 1 mm. long; the teeth of the limb lanceolate, acutish, 3 mm. long, 1 mm. wide. The whole corolla is granulated on its outer surface.

Among Ekman's Cuban Eupatoriums, sent to the writer for identification, there was found a new *Salmea* of eupatorioid habit. It may be put on record as follows:

Salmea umbratilis, spec. nov., fruticosa non scandens 5 dm. vel ultra altitudine; caulibus teretibus cortice griseo-brunnea tectis 2 mm. diametro adscendenter ramosis; internodiis 3–5.5 cm. longis juventate prorsum hispidulis; foliis oppositis breviter petiolatis subdeltoideo-ovatis obtusis vel acutiusculis utroque plerumque 1(–2)-dentatis basi rotundatis supra in costis et venis principibus puberulis subtus hispidulis paullo supra basin 3-nervatis utrinque reticulatis 2.5–3.5 cm. longis 1.8–2.3 cm. latis subtus pallidioribus textura firmiuscule membranaceis; nervis venulisque supra impressis subtus prominulentibus; petiolo 4–6 mm. longo; corymbis terminalibus (3–4 cm. longe) pedunculatis convexis ca. 6-capitulatis; pedicellis 3–6 mm. longis;

capitulis ca. 7 mm. altis 1 cm. diametro; involucri campanulati squamis ovalibus apice rotundatis persistentibus; paleis oblanceolatis apicem versus erosis; corollis in tubo cum glandulis globularibus ornatis; achaeniis sursum in marginibus villoso-ciliatis apice biaristatis.—CUBA: Province Pinar del Rio: shady places at about 500 m. on steep limestone cliffs, region of the Mozotes in the Sierra del Sitio Santo Tomas, 10 June, 1923, *Ekman*, no. 16,631 (TYPE, in Gray Herb.).

This plant is manifestly close to the little known *S. glaberrima* Wright, collected on the Guajaibon Mountain by Wright in the early sixties and rediscovered and again collected by *Ekman* in 1921, but *S. glaberrima* is really glabrous, it has larger leaves of a somewhat more rounded contour and subcordate at the pinnately 5-nerved base. Furthermore their upper surface (at time of anthesis) is reticulated with clearly elevated veinlets while those in *S. umbratilis* are impressed even in specimens collected after flowering. While it is possible that these two plants, so nearly related, may yet be found to intergrade, their differences are too marked to permit them to be classed as conspecific in our present ignorance of any such intergrading tendencies.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
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STUDIES IN THE BORAGINACEAE.—VI.

A REVISION OF THE SOUTH AMERICAN BORAGINOIDEAE.

BY IVAN M. JOHNSTON.

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A REVISION OF THE SOUTH AMERICAN BORAGINOIDEAE.

By Ivan M. Johnston.

In the present paper an attempt has been made to give a critical descriptive account of the American species of the subfamily *Boraginoideae* now known from south of Panama. The species of this group were last brought together in the general account of the whole subfamily published in 1846 in the 10th volume of DeCandolle's Prodromus. Since the appearance of this scholarly treatment great changes have come about, the generic classification has been well nigh remade and the great abundance of the group in the Chilean flora has become known, the recognized species being much more than doubled. The subfamily having the South American distributional center in Chile, the recent work dealing most extensively with these plants is Reiche's account of the family published serially in the Anales de la Universidad de Chile (vol. cxxi) in 1907 and 1908 and as part of his Flora de Chile (vol. v) in 1910. This treatment is very disappointing, for through the author's careless and often manifestly inaccurate interpretations of the Philippian species, the types of which he might have studied, he has only added to that confusion in the literature on the Chilean flora that first arose from R. A. Philippi's over zealous multiplication of species.

The classification here presented has developed from a fairly detailed account of the Chilean species which I prepared in 1926 while studying in the Philippi herbarium at the Museo Nacional in Santiago. After my return from Chile I was loaned the South American material of the group from the collections of the United States National Herbarium, the New York Botanical Garden and the Field Museum of Chicago. With this extensive material to supplement the rich collections of the Gray Herbarium the extra-Chilean species were also studied, the account of the Chilean species thoroughly revised and the present paper written. Though as thorough and critical as the materials and facilities available permitted, the following treatment makes no pretense at finality, but is believed to afford a consistent and logical summary of our present knowledge, thus providing a sound foundation for the work still to be done in further elucidation of the complexities of this interesting group.

Without opportunity to study the extensive and fundamental collections of Philippi in the Museo Nacional at Santiago the subjoined account of the South American *Boraginoideae* could never have been written. I am, therefore, under particular obligation to the Committee on Sheldon Fellowships at Harvard University for the privilege

of visiting Chile as a Sheldon Traveling Fellow. I am also extremely indebted for the very courteous treatment which I received from the staff of the Museo Nacional de Chile at Santiago. Prof. Carlos Porter, Prof. Marcial R. Espinoza, Sr. Luis Moreira, Sr. Gualterio Looser and Sr. Gilberto Montero were very friendly and helpful and did much to make my work in the museum both pleasant and profitable. I am particularly indebted, however, to Prof. Francisco Fuentes, Curator of the Phanerogamic Herbarium, through whose friendliness and courtesy I was afforded every facility for studying the famous collection which is in his charge. While at Santiago I also received very courteous treatment from Prof. Victor M. Baeza, of the Instituto Pedagóico de Chile, being through his kindness permitted to study the fine herbarium of recent collections brought together by his efforts and those of Prof. Federico Johow and their students.

Various persons have assisted me in important details. Dr. H. M. Hall of the Carnegie Institution and Mr. E. P. Killip of the United States National Museum generously procured for me photographs of various essential types in the European herbaria. Prof. H. Lecomte of the Muséum d'Histoire Naturelle, Paris, most kindly sent for my examination, fragments of certain obscure species of Clos and Weddell. Dr. A. Brand, the well known monographer of the family, in generous coöperation has provided me with fragments of and notes concerning his recently published South American species. I have also been much aided by notes and specimens received from Dr. A. W. Hill, Director of the Royal Gardens at Kew, Prof. Carl Skottsberg of the Göteborgs Botaniska Trädgård, Prof. C. C. Hosseus, of the Universidad Nacional de Córdoba, Prof. Lucien Hauman, formerly of the Universidad de Buenos Aires, Dr. Alberto Castellanos of the Museo Nacional of Buenos Aires, Prof. L. R. Parodi of the Universidad de Buenos Aires, and the late Carlos Spegazzini of La Plate. Of great aid in the present work, have been the large loans received from the United States National Herbarium through Dr. W. R. Maxon, from the New York Botanical Garden through Dr. N. L. Britton and from the Field Museum of Natural History of Chicago through Mr. D. C. Davies and Mr. J. F. Macbride. In preparation of this paper, as well as in the previous ones of the series, I have profited much from the suggestions and the able editorial assistance of Prof. B. L. Robinson as well as from the help in bibliographic matters received from the librarian of the Gray Herbarium, Miss Ruth D. Sanderson. Greatly appreciating the aid of all these persons, who have so courteously responded to my needs, I would here express my hearty thanks for their generous assistance.

In the systematic account, which follows, I have cited all the material which I have examined. I have tried to arrange the collections listed in geographical sequence grouping them under the countries and the major subdivisions (Provinces or Departments) of the countries. Following the citation of each collection, I have appended in parenthesis initials indicating the herbarium in which I have seen material of the particular collection. The initials used and the herbaria they indicate are as follows—"G" for Gray Herbarium, "NY" for New York Botanical Garden, "US" for United States National Herbarium, "FM" for Field Museum of Chicago, "MS" for the Museo Nacional of Santiago and "IP" for the Instituto Pedagóico of Santiago.

Artificial Key to South American Genera.

Nutlet wing-margined or appendaged dorsally.
  Nutlets with appendages or teeth of the margin tipped with stout uncinate bristles, the body usually with uncinate pubescence; slender herbs with the lowermost leaves opposite.....17. *Pectocarya.*
  Nutlets with glochidiate appendages; leaves all alternate.
    Nutlets equalling the subulate gynobase to which they are affixed for nearly their whole length along the ventral keel.....13. *Lappula.*
    Nutlets much longer than the pyramidal gynobase to which they are affixed by a broad areola.
      Nutlets spreading or divergent, not keeled ventrally; areola apical or lateral and extending down from the apex of the nutlet.....16. *Cynoglossum.*
      Nutlets ascending, keeled ventrally above the medial areola.
        Pedicels recurving in fruit; inflorescence paniculate, sparsely bracted or naked; herbs.....14. *Hackelia.*
        Pedicels erect in fruit; inflorescence corymbose, bractless; shrub.....15. *Selkirkia.*
Nutlets neither wing-margined nor appendaged dorsally.
  Attachment-surface of nutlet plug-shaped, strophiolate, surrounded by a tumid rim.
    Corolla subrotate, suggesting that of a Solanum; stamens conspicuously exserted, appendaged dorsally.....7. *Borago.*
    Corolla salverform; stamens included, unappendaged.....6. *Anchusa.*
  Attachment-surface of nutlets flat, convex or annulate, simple or carunculate, not surrounded by a tumid rim.
    Stamens very unequal, some exserted; corolla irregular.....5. *Echium.*
    Stamens equal, usually included; corolla regular.
      Corolla-lobes contorted in the bud.....8. *Myosotis.*
      Corolla-lobes imbricated in the bud.
        Calyx or bracts with uncinate hairs.
          Inflorescence bracted; nutlets stipitate.....3. *Thaumatocaryon.*
          Inflorescence bractless; nutlets sessile.....4. *Moritzia.*
        Calyx or bracts completely lacking uncinate hairs.
          Nutlets with a broad basal attachment; leaves all alternate.....1. *Lithospermum.*

Nutlets attached laterally; at least lower leaves opposite.
Corolla blue; stigmas geminate.....2. *Antiphytum.*
Corolla not blue; stigmas solitary and simple.
Corolla yellow or orange, throat unappendaged. 12. *Amsinckia.*
Corolla white, throat appendaged.
Nutlets with pericarpial wall fused above middle to form a definite medial ventral keel. 11. *Plagiobothrys.*
Nutlets with a medial ventral groove formed by the non-fusion of the pericarpial wall.
Calyx cut to base, distinct from the bracts. 9. *Cryptantha.*
Calyx cylindrical, merely toothed, with floral bracts decurrent on its lower part.....10. *Nesocaryum.*

I. Tribe Lithospermeae.

Nutlets erect, straight or rarely bent, smooth or rough, unmargined; areola basal or occasionally suprabasal, near tip of cotyledon, unmargined, flat or nearly so, not at all strophiolate, usually sessile but occasionally stipitate; gynobase flat or low-pyramidal, not excavated; style cleft or entire; stigmas 2 or exceptionally 4, distinct or proximate or rarely fused, capitate or obscurely thickened; corolla yellow or orange or occasionally white or somewhat purplish.—Johnston, Contr. Gray Herb. lxxiii. 43 (1924).

Key to Genera.

Corolla with conspicuously oblique limb and unequal stamens...5. *Echium.*
Corolla with horizontal limb and equal stamens.
Mature calyx cut to near base, the elongate lobes erect or spreading; nutlets usually 4, falling individually; calyx and bracts lacking uncinate hairs.
Nutlet-areola basal, sessile; leaves all alternate.....1. *Lithospermum.*
Nutlet-areola suprabasal, sessile or stipitate, at least the lower leaves opposite..... 2. *Antiphytum.*
Mature calyx cylindrical or ellipsoid, merely toothed with the teeth connivent over the fruit; nutlets solitary, falling away tightly invested by the calyx; calyx or bracts with uncinate pubescence.
Inflorescence bracted; calyx lacking uncinate hairs; corolla-throat pubescent along obscure horizontal plaits; nutlet with stipitate areola.....3. *Thaumatocaryon.*
Inflorescence bractless; calyx with uncinate hairs; corolla-throat with circular villous spots or intruded appendages; nutlet with sessile basal areola.....4. *Moritzia.*

1. **Lithospermum** L.

Calyx usually divided. Corolla tubular or salverform; tube cylindrical; lobes spreading, imbricate; throat with intruded appendages or

with pubescent or glandular areas; stamens affixed in tube, included; filaments short; anthers oblong, usually with apiculate connectives. Style filiform. Stigmas geminate. Ovules 4. Nutlets 4 or rarely fewer, erect, ovoid or angular, smooth or verrucose, affixed by a broad horizontal or slightly oblique basal areola. Gynobase flat or very broadly pyramidal.—Annual or perennial, herbaceous or fruticose plants with alternate leaves. Flowers white, yellow or violet, in bracted racemes.—Sp. Pl. 132 (1753) and Gen. Pl. 64 (1754). *Batschia* Gmel. Syst. ii. 315 (1791). *Cyphorima* Raf. Jour. Phys. lxxxix. 98 (1819). *Pentalophus* A. DC. Prodr. x. 86 (1846).

A large genus with about 30 species in North America and 20 in the Old World. The South American clearly have been derived from those of Mexico and Central America.

Key to Species.

Nutlets dull and very much roughened; mature calyx oblique and chartaceous at base; introduced annual.....1. *L. arvense.*
Nutlets smooth and shiny; mature calyx herbaceous, not noticeably oblique; indigenous perennials.
  Corollas 15–36 mm. long, yellowish, tube surpassing the calyx 1 cm. or more, throat without protruding appendages; Peru.
    Corolla 25–36 mm. long, hispidulous; stems with loosely appressed or spreading pubescence.....2. *L. cinerascens.*
    Corolla 15–18 mm. long, villous-strigose; stems closely strigose.....3. *L. Macbridei.*
  Corollas 3–10 mm. long, white or ochroleucous, tube surpassing the calyx 5 mm. or less, throat with pubescent protruding appendages.
    Corolla 1 cm. long; plant 3–5 dm. tall; Colombia and Venezuela.....4. *L. mediale.*
    Corolla 3–6 mm. long; plant less than 1.5 dm. tall; Peru.
      Corolla 5–6 mm. long; leaves 10–20 mm. long.....5. *L. Shepardae.*
      Corolla 3.5–4 mm. long.
        Leaves 4–6 mm. long.....6. *L. Gayanum.*
        Leaves 12–30 mm. long.....7. *L. peruvianum.*

1. **Lithospermum arvense** L. Annual; stems erect, 2–7 dm. tall, one to several, simple or sparsely branched above, hoary-strigose; leaves 2–5 cm. long, 2–8 mm. broad, closely appressed-hispid, firm, veinless, with prominent midrib, pale beneath; basal leaves rosulate, oblanceolate or spathulate, those of the mid-stem acute and lanceolate or linear; racemes bracted, becoming loosely flowered; calyx parted into subulate-linear lobes, hispid; mature calyx with the erect or ascending lobes becoming 8–13 mm. long, the very short tube oblique pale and chartaceous; pedicels short and stout, ca. 1 mm. long; corolla white or yellowish or even purplish, 5–7 mm. long, tubular-funnelform, the tube glabrous within and scarcely if at all surpassing the

calyx; corolla-throat gradually expanded, without protuberances, merely puberulent; corolla-lobes ascending, ovate, obtuse; nutlets brown, dull, roughened, tuberculate or rough-wrinkled or pitted, ca. 3 mm. long, triquetrous-ovate.—Sp. Pl. 132 (1753); Johnston, Contr. Gray Herb. lxx. 21 (1924).

ARGENTINA. BUENOS AIRES: Sierra de la Ventana, Dec. 1911, *Hauman* (G); vicinity of Buenos Aires, *Ezlikman 10* (G); Villa Soldati, Nov. 1924, *Parodi 5961* (G).

A European plant, widely introduced in the United States, which can now be reported from the Argentine.

2. **L. cinerascens** (A. DC.) Johnston. Perennial (?); stem ca. 2.5 dm. tall, simple, erect, cinerescent, somewhat shaggy, very loosely appressed or spreading short-hispid; leaves lanceolate, firm, 1.5–2.5 cm. long, 4–6 mm. long, acute, erect, crowded, densely appressed-hispid, cinerescent, somewhat bulbous-pustulate, base sessile and rounded, midrib prominent beneath, margins slightly involute; racemes terminal, bracteate, few-flowered; calyx divided into narrowly linear acute lobes, appressed short-hispid, in flower 5–8 mm. long; pedicels ca. 3 mm. long, slender; corolla yellowish, tubular with a slight contraction towards the base, 2.5–3(–3.6?) cm. long, hispidulous outside, lobes spreading and ca. 3 mm. long, throat weakly differentiated; nutlets ovoid, white, shiny, sparsely punctate, ca. 3 mm. long; style subexserted, very long and slender.—Contr. Gray Herb. lxxv. 40 (1925). *Macromeria cinerascens* A. DC. Prodr. x. 69 (1846); Johnston, l. c. lxx. 15 (1924).

PERU. AMAZONAS: Chachapoyas, *Matthews* (G, photo. of TYPE).

I know this species only from the original description and from an excellent photograph of the type specimen. From these sources the above description has been drawn. The species has obvious affinities with *L. Macbridei* of central Peru, but is also related to *L. Palmeri* Wats. and *L. viride* Greene of northern Mexico and adjacent United States and with *L. guatemalense* Donn. Sm. and *L. oblongifolium* Greenm. of Guatemala and southern Mexico. These more northern species besides being widely separated from it geographically, have broader more herbaceous veiny leaves and so are readily separable from *L. cinerascens* and its Peruvian relative, *L. Macbridei*.

3. **L. Macbridei**, sp. nov. Perenne; caulibus pluribus fruticulosis simplicibus erectis 2–6 dm. altis e radice lignosa erumptentibus cinerescentibus breviter et saepe dense strigosis; foliis anguste lanceolatis vel oblanceolatis 2–5 cm. longis 4–6 mm. latis acutis vel obtusis congestis stricte ascendentibus breviter strigosis firmis cum costa prominenti

margine leviter recurvis; racemis terminalibus paucifloris bracteatis; calycibus strigosis floriferis 4–5 mm. longis fructiferis 5–6 mm. longis; pedicellis maturitate ca. 1 cm. longis falcatis strictis; corollis viridiflavis tubuliformibus 15–18 mm. longis, tubo attentuate cylindrato 3–4 mm. crasso calycem ca. 1 cm. superanti intus glaberrimo extus villoso-strigoso; lobis divaricatis vel recurvatis orbicularibus 2.5–3 mm. longis; faucibus exappendiculatis obscurissime puberulenti-pubescentibus; staminibus supra medium tubi affixis, filamentis quam antherae lineares 2 mm. longae brevioribus; nuculis ovoideis albis lucidis 2.8–3.2 mm. longis calyce evidente brevioribus; stylo longissimo gracillimo.

PERU. HUANUCO: densely shrubby northeastern slope, Yanahuanca, 3000 m. alt., June, 1922, *Macbride & Featherstone 1185* (FM, TYPE; G, US, ISOTYPES); steep grassy slopes, Chinchapalca above Mito, 2850 m. alt., July 1922, *Macbride & Featherstone 1592* (FM); grassy eastern canyon slope, Llata, 2100 m. alt., Aug. 1922, *Macbride & Featherstone 2253* (FM).

Evidently allied to *L. cinerascens* of northern Peru but differing in having smaller corollas and in being closely appressed-strigose rather than loosely or spreadingly hispid. The corolla-structure is quite like that of the North American *L. viride* Greene and *L. Palmeri* Wats.

4. **L. mediale** Johnston. Perennial; stems several, erect, 3–5 dm. tall, simple or occasionally very sparsely branched, cinerescent, appressed pallid-hispid or hispid-strigose and very densely so on the younger parts; leaves oblong-lanceolate or oblong-ovate, 3–6(–9) cm. long, 4–13(–17) mm. broad, firm, acute, appressed short-hispid, finely pustulate, midrib prominent beneath; racemes terminal, leafy; calyx parted into narrowly linear appressed villous-hispid lobes; pedicels strictly ascending, 1–3(–5) mm. long; corolla white or ochroleucous, ca. 1 cm. long; tube cylindrical, almost twice the length of the calyx, villulose outside, glabrous within, ca. 2–2.8 mm. thick; lobes 1–2 mm. long, widely spreading or divergent, orbicular; throat with 5 prominent oblong pubescent appendages; filaments attached above middle of the tube, shorter than the anthers, anthers almost 1 mm. long; nutlets 2–3, white and shiny, 2.5–3 mm. long, clearly surpassed in length by calyx and style.—Contr. Gray Herb. lxx. 28 (1924).

VENEZUELA. MÉRIDA: between Mucurulea and Mucuchies, 2700 m. alt., Jan. 1922, *Jahn 801* (G, NY).

COLOMBIA. CUNDINAMARCA: railroad bank, Zipacon, 2500 m. alt., Aug. 1917, *Rusby & Pennell 1217* (G); meadow on sabana, Sibate, 2600 m. alt., Oct. 1917, *Pennell 2468* (G, NY); Facatativa, *André 669* (NY); vicinity of Bogotá, near Tequendama Falls, Dec. 1852, *Holton* (NY); San Antonio, 1905, *Ariste-Joseph A-447* (G). INDEFINITE: without locality, *Ariste-Joseph B-44* (US); El Dintel, Jan. 1920, *Ariste-Joseph A-525* (G.)

This species also occurs in Central America. Its relations are among the white-flowered Mexican species.

5. **L. Shepardae**, sp. nov. Perenne fruticulosum nanum breviter cinereo-strigosum e radice subsimplici crassa oriens; caulibus prostratis vel ascendentibus 4–12 cm. longis ramosis foliosis; foliis alternis subcoriaceis acutis vel obtusis subtus cum costa prominenti spathulato-obovatis vel anguste oblanceolatis 1–2 cm. longis 2–4 mm. latis basem versus contractis, strigosis et inconspicue tuberculato-pustulatis margine leviter recurvatis, superioribus paullo reductis; racemis terminalibus brevibus foliaceo-bracteatis; lobis calycis oblongis vel linearibus; corolla alba evidenti 5–6 mm. longa, tubo 3 mm. longo cylindrico calycem evidente superanti, lobis rotundis divaricatis 2–2.5 mm. longis, limba 5–7 mm. lata, faucibus cum appendiculis 5 pubescentibus oblongis prominentibus; nuculis 4 ovoideis lucidis laevibus 2–2.3 mm. longis in maturitate calycis lobos atque stylum paulum superantibus.

PERU. Puno: rocky clay soil on puna, Chuquibambilla, 3900–4000 m. alt., April 1925, *Pennell 13357* (G, FM); mountain-side near Puno, 3750 m. alt., Dec. 1920, *Mrs. Reid S. Shepard 114* (G, TYPE).

Apparently most related to *L. Gayanum* from which it differs in its larger leaves and flowers, its shorter sparser pubescence and more southern range. The corolla of *L. Gayanum* is salverform and has a narrow limb. In *L. Shepardae* the limb is very broad, in fact much broader than the tube is long, and the corolla hence appears to be rotate.

6. **L. Gayanum** (Wedd.), comb. nov. Perennial from a strong root; stems much branched from the base, fruticulose, procumbent or ascending, 3–5 cm. long, leafy, densely pale-strigose; leaves lanceolate to lance-elliptical or lance-spathulate, obtusish or acute, subcoriaceous with a prominent midrib beneath, densely appressed pale short-hispid, 4–6 mm. long, 1.5–2 mm. broad, the basal leaves slightly larger and shortly petiolate; racemes apical, short, few-flowered, bracteate throughout; calyx with linear acute lobes; pedicels obscurely developed; corolla white, 3.5–4 mm. long, tube ca. 2.5 mm. long and only slightly surpassing the calyx, lobes rotund and spreading, throat with 5 protruding oblong pubescent appendages; nutlets 4 or by abortion fewer, ovoid, shiny, becoming as long as style and calyx-lobes.—*Eritrichium Gayanum* Wedd. Chlor. Andina ii. 88 (1859). *L. andinum* Krause in Engler's Jahrb. xxxvii. 636 (1906).

PERU. Cusco: Andes of Cusco, *Gay* (G, fragment of the TYPE of *E. Gayanum*).

A species of central Peru characterized by its dwarf habit, very small leaves and small flowers.

7. **L. peruvianum** A. DC. Perennial, hispid; stem branched, terete, woody at base, with spreading hairs; leaves linear, acute, 1.2–3 cm. long, 2–4 mm. broad, crowded, tuberculate-pustulate; racemes few-flowered, leafy-bracted; calyx 5-parted into acute linear lobes, appressed-pubescent; corolla white (?), 4 mm. long, appressed-pilulose outside, funnelform above the middle, tube scarcely surpassing the calyx, lobes ovate and obtuse, throat with pubescent protuberant appendages; anthers included, not reaching the appendages, not mucronate, filaments short, nutlets usually solitary by abortion, 2 mm. long, ovoid, white and shiny, punctate.—Prodr. x. 77 (1846).

The description given above is adapted from the original given by DeCandolle. I know the plant only from description. The type was collected at Chachapoyas in northern Peru by Matthews. The species seems to be related to *L. Gayanum*.

Doubtful or Excluded Species.

L. aggregatum R. & P. Fl. Peruv. ii. 4 (1799); Lehm. Asperif. ii. 313 (1818).—Apparently a species of *Coldenia*, C. PARONYCHIOIDES Ph., cf. Johnston, Contr. Gray Herb. lxx. 60 (1924).

L. CUNEIFOLIUM Pers. Syn. i. 158 (1805); Lehm. Asperif. ii. 307 (1818). *L. incanum* R. & P. Fl. Peruv. ii. 4 (1799); not *L. incanum* Forst. f. (1797).—Tarma, Peru. Described as an annual with cuneiform leaves, solitary axillary flowers and shiny ovate acuminate nutlets.

L. dichotomum R. & P. Fl. Peruv. ii. 5, t. 111c (1799).—This is a *Coldenia*, C. DICHOTOMA (R. & P.) Lehm.

2. **Antiphytum** DC.

Calyx cut to base or nearly so. Corolla-tube cylindrical; lobes imbricate, rounded, spreading or laxly ascending; throat with intruded ciliate or papillate appendages; stamens included, attached at middle of tube, filaments slender, short; anthers oblong. Style slender, included in tube; stigmas geminate. Ovules 4. Nutlets 4, erect, ovoid or angulate, rugose or verrucose; areola inframedial or supra-basal, at lower end of ventral keel or terminating a downward-projecting stipitate prolongation of the keel springing from just above the base of the nutlet. Gynobase flat to depressed-pyramidal.—Perennial fruticose or fruticulose plants. Leaves opposite at least at the very base of the plant, linear to lanceolate. Racemes bracted. Corolla

blue, yellowish or white.—DC. in Meisner, Gen. i. 280; ii. 188 (1840); Johnston, Contr. Gray Herb. lxviii. 48 (1923). *Amblynotopsis* Macbr. Contr. Gray Herb. xlviii. 41 (1916).

The definition of this genus is still subject to revision. As here defined it is a group most related to *Lithospermum* and consists of several fruticose perennials of Uruguay and perhaps adjacent Brazil, as well as a group of slightly less fruticose Mexican plants to which the generic name *Amblynotopsis* is applicable. The material which I have studied of true *Antiphytum*, that is to say the South American plant, is too meagre and incomplete to yield precise knowledge as to their characteristics. Since no one has yet pointed out fundamental characters which set off the Mexican species from the true *Antiphyta* of South America I have drawn my generic diagnosis to cover both.

Key to Species.

Leaves linear-lanceolate, 1.5–4 cm. long, 3–6 mm. broad, obscurely nerved, margins flat; racemes paniculately disposed.....1. *A. cruciatum.*

Leaves linear, 1.5–2.5 cm. long, 1–2 mm. broad, nerveless, margins revolute; racemes geminate and terminal.2. *A. stoechadifolium.*

1. **Antiphytum cruciatum** (Cham.) DC. Perennial, fruticose, 3–5 dm. tall; stems erect, appressed-hispid, canescent, ascendingly branched, decorticating in age; leaves linear-lanceolate or lanceolate, 1.5–4 cm. long, 3–6 mm. broad, appressed-hispid, sparsely and inconspicuously veined, acutish, attenuate apically, opposite with narrowly connate subsheathing bases, becoming reduced up the stem, margin weakly if at all revolute, midrib prominent and hispid underneath; racemes paniculately disposed above, bracted throughout, the bracts lanceolate, lateral and not surpassing the calyx; calyx (at anthesis) ca. 3 mm. long, appressed-hispid, 5-parted, the lobes lanceolate, unequal with the abaxial pair the largest; pedicels very short; corolla-tube short, surpassed by calyx; corolla-lobes rotund, pubescent outside, about length of tube; throat with rotund fimbriate appendages; stamens included, anthers elliptical; filaments very short, affixed at middle of tube; nutlets unknown; style short, stout, with emarginate stigma.—Prodr. x. 121 (1846); Fresen. in Mart. Fl. Brasil. viii. pt. 1, 64 (1857); Johnston, Contr. Gray Herb. lxviii. 51 (1923). *Anchusa cruciata* Cham. Linnaea iv. 438 (1829).

I have seen no material referable to this species. The above description is adapted from the original one given by Chamisso. The species seems to be congeneric with, and closely related to *A. stoechadifolium*, which differs, according to Chamisso, in its solitary terminal

cymes, larger flowers, very pale revolute-margined leaves and different habit. The type of *A. cruciatum* is given as having come from southern Brazil. I suspect it is from northern Uruguay or adjacent Brazil.

2. **A. stoechadifolium** (Cham.) DC. Perennial, fruticose, 1.5–3 dm. tall; stems erect with strictly ascending branches, appressed pale-hirsute, cinerescent, stipitate-glandular above, in age decorticating and becoming smooth and brown; leaves linear, acutish, 1.5–2.5 mm. long, 1–2 mm. broad, veinless, opposite with narrowly connate sub-sheathing bases, becoming reduced and loosely disposed up the stem, upper surface appressed-hirsute, occasionally somewhat glandular, the lower surface densely villous-strigose and somewhat silvery, frequently covered by the meeting of the prominent hirsute midrib and the revolute margins; racemes geminate, 2–4 cm. long, few-flowered, strictly ascending, bracted throughout; bracts opposite or beside the flowers, broadly lanceolate; calyx cut to middle or beyond into erect or loosely connivent lanceolate slightly unequal lobes, densely appressed-hirsute, 5–6 mm. long at maturity; pedicels stout, 1–2 mm. long; corolla blue, ca. 5 mm. long; tube ca. 2.5 mm. long, 2.5–3 mm. thick at summit, tapering to ca. 1.5 mm. thick at base, shortly surpassed by calyx, glabrous outside, inside glabrous except for the villous tufts associated with the 5 wart-like appendages at the base; limb 6 mm. broad, concave; lobes rounded, ca. 2 mm. long, appressed short-villous on middle outside; throat with 5 erect squarish trapeziform emarginate appendages (ca. 1 mm. long) of intruded tissue, margin and outer face of appendages covered with stout white hairs; stamens included, attached at middle of tube; anthers oblong, ca. 1 mm. long; filaments ½–⅔ length of anthers; nutlets 4, ca. 2 mm. long, ovate, tuberculate-rugose, back rounded, edges obtuse, with a strong ventral keel prolonged down below to form a stout short stipe; style surpassing the nutlets, ca. 2.5 mm. long, bearing geminate stigmas.—Prodr. x. 121 (1846); Fresen. in Mart. Fl. Brasil. viii. pt. 1, 64 (1857); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 119, fig. 47e-f (1893). *Anchusa stoechadifolia* Cham. Linnaea iv. 439 (1829). *Myosotis Berroi* Arech. Anal. Mus. Nac. Montevideo ser. 2, i. 69, fig. 5–6 (1911) and op. cit. ser. 1, vii. (Fl. Urug. iv.) 181, fig. 13–14 (1911).

BRAZIL: without locality, *Sellow 1840* (G, ISOTYPE of *A. stoechadifolia*).

The above description is based upon the specimen cited, supplemented by some details from Chamisso's lengthy original description. I know *Myosotis Berroi* only from description, but feel quite confident that it is synonymous. It was collected in the Department of Rivera, in northern Uruguay, which Sellow is known to have traversed and

explored during the early part of 1823. It is, hence, not impossible that the types of *Anchusa stoechadifolia* and *Myosotis Berroi* were both obtained in northern Uruguay and perhaps in the same region.

Doubtful Species.

Myosotis uruguayensis Arech. Anal. Mus. Nac. Montevideo ser. 2, i. 68, fig. 4 (1911) and op. cit. ser. 1, vii. (Fl. Urug. iv.) 180, fig. 12 (1911).—From Dept. of Tacuarembo in northern Uruguay; a fruticose plant probably of this genus and apparently nearest to *A. cruciatum* but differing in its alternate leaves and tubular calyx. I have seen no material of this species.

3. **Thaumatocaryon** Baill.

Calyx campanulate, toothed, in age accrescent, ellipsoid, closely investing and with the short teeth connivent over the mature fruit, closely subtended by uncinate-pubescent bracts. Corolla-tube broadly cylindrical, surpassing the calyx; lobes ovate or orbicular, spreading, imbricate, obtuse; throat densely pubescent along 5 obscure horizontal plaits; stamens included, attached at middle of tube, filaments slender slightly longer than the obtuse oblong anthers. Style filiform, short; stigma deeply bilobed. Ovules 4. Nutlets solitary by abortion, ovoid, erect, smooth or minutely tuberculate, ventral keel strong and above the base abruptly drawn out into a stout strongly deflexed stipe bearing the areola. Gynobase flat or low-convex.—Perennial herbs with at least the very basal leaves opposite, leafy. Inflorescence of pedunculate bracted forked spikes. Corolla white (?) or blue.—Bull. Mens. Soc. Linn. Paris 839 (1890).

A well marked genus of western and southern Brazil which, although in the past confused with *Antiphytum*, is evidently most closely related to *Moritzia*.

Key to Species.

Stem-leaves all opposite; corolla blue; nutlets smooth and shiny.
1. *T. tetraquetrum.*

Stem-leaves alternate above the base; corolla white (?); nutlets (at least in no. 3) minutely low-tuberculate and dull.
- Corolla-limb ca. 5 mm. broad; pubescence spreading; basal leaves in persistent tuft.....2. *T. dasyanthum.*
- Corolla-limb 2.5–3 mm. broad; pubescence strigose, closely appressed; basal leaves neither tufted nor persistent..3. *T. Sellowianum.*

1. **Thaumatocaryon tetraquetrum** (Cham.) Johnston. Perennial; stems erect 3–8 dm. tall, simple or with short branches above, puberulent and hispidulous above but glabrate below; leaves acute,

scabrous, sparsely hispidulous, the hairs on the upper face with discoid bases; lower leaves tufted, the blade 9–15 cm. long, 2.5–4.5 cm. broad, broadly lanceolate, broadest above the middle, gradually contracted below into a narrowly winged petiole 7–15 cm. long; cauline leaves all opposite, broadly lanceolate or lance-elliptical or narrowly ovate, 5–10 cm. long, 1.5–3 cm. broad, sessile by a rounded base; peduncles densely puberulent and appressed-hispidulous; calyx at anthesis 2 mm. long, cut to middle into 5 lance-triangular lobes; mature calyx densely villulose, narrowly ovoid, 3–4 mm. long, 2 mm. thick, sessile, teeth short, 1 mm. long; corolla blue, 5–6 mm. long; limb spreading, 4.5–5.5 mm. broad; lobes orbicular, 1.5–2 mm. long, strigose and puberulent outside; tube 2.5–3 mm. long, 1.5–2 mm. thick, cylindrical, narrowed at the base, glabrous within, colored and puberulent above the middle outside; throat densely villous along horizontal plaits; filaments filiform, attached at middle of tube, ca. 0.8 mm. long; anthers oblong, ca. 0.6 mm. long, included; nutlet narrowly ovoid, smooth and shiny, 3 mm. long, with the strong ventral keel prolonged as a stout abruptly incurving stipe; style very short, not reaching to middle of nutlet.—Contr. Gray Herb. lxx. 12 (1924). *Anchusa tetraquetra* Cham. Linnaea viii. 113 (1833). *Antiphytum tetraquetrum* DC. Prodr. x. 122 (1846); Fresen. in Mart. Fl. Brasil. viii. pt. 1, 64 (1857); Johnston, l. c. lxviii. 51 (1923). *T. Hilarii* Baill. Bull. Mens. Soc. Linn. Paris 839 (1890); Johnston, l. c. lxx. 12 (1924). *Antiphytum Bornmuelleri* Pilger in Fedde, Repert. iii. 24 (1906). *Antiphytum Bornmuelleri*, var. *asperior* Pilger, l. c. 25.

BRAZIL. PARANÁ: marshy places, Curityba, 900 m. alt., *Dusén 15631* (G) INDEFINITE: no locality given, *Sellow* (US, ISOTYPE of *A. tetraquetra*).
PARAGUAY. Sierra de Maracayú, Nov., *Hassler 5231* (G); "in regione fluminis Alto Parana." *Fiebrig 5885* and *6131* (G).

This plant frequents wet places in eastern Paraguay, Chodat, Bull. Soc. Bot. Genève ser. 2, xii. 158 (1920) and Bull. Herb. Boiss. ser. 2, ii. 817 (1902), and southern Brazil. Baillon, Pilger and Chodat have reported the plant from Rio Grande do Sul. Glaziou, Bull. Soc. Bot. France lvii. Mem. 3, 480 (1910), reports it, perhaps upon a misdetermination, from Curalinho in Bahia.

The plant from Rio Grande do Sul has been twice described. Unfortunately I have seen no material from this state and have been forced to judge the proposed segregate upon the basis of descriptions alone. With the exception that the leaves are described as slightly broader and perhaps slightly cordate at the base, there appear to be no differences given that serve to separate it from true *A. tetraquetrum*.

2. **T. dasyanthum** (Cham.) Johnston. Perennial; stems several,

erect or ascending, 6–8 dm. tall, simple, leafy, scabrous, sparsely hispid and pubescent with spreading or retrorse hairs; leaves scabrous, hispid, somewhat glabrescent in age, the hairs with persistent discoid bases; lower leaves persistent at anthesis, opposite, 10–15 cm. long, 2.5–4.5 cm. broad, lanceolate or ovate-lanceolate, gradually contracted into a long winged petiole; middle leaves oblanceolate or spathulate, petiolate, 6–8 cm. long, alternate; upper leaves oblong, sessile by a triangular base, alternate, 3–5 mm. long; peduncles shaggy, densely retrorse-spreading hispidulous and sparsely hispid; calyx (at anthesis) very densely appressed short-villous, 1.8 mm. long, cut almost to middle into 5 lanceolate lobes, sessile; corolla white (?); limb spreading, ca. 5 mm. broad; lobes ovate, pubescent outside, ca. 1.8 mm. long; tube 2.5–3 mm. long, almost 2 mm. thick, cylindrical, appressed-pubescent outside, glabrous within; throat densely villous along horizontal plaits; filaments subulate, affixed at middle of tube, ca. 1 mm. long; anthers oblong, ca. 0.7 mm. long; ovules 4, apparently only one maturing; mature nutlets unknown; stigma deeply bilobed. —Contr. Gray Herb. lxx. 12 (1924). *Anchusa dasyantha* Cham. Linnaea iv. 437 (1829); DC. Prodr. x. 52 (1854). *Moritzia dasyantha* Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63 (1857).

BRAZIL: no locality given, *Sellow 7964* (US, ISOTYPE).

3. **T. Sellowianum** (Cham.) Johnston. Perennial; stems erect, several, simple, ca. 4.5 dm. tall, strigose with the hairs antrorsely hispid and very appressed; leaves closely strigose, the hairs all with discoid bases though these sometimes obscure, oblanceolate to oblong or elliptical, 2–7 cm. long, 1–2.3 mm. broad, obtuse or acute, lower ones opposite and apparently neither tufted nor persistent, contracted into a winged petiole, upper ones alternate and sessile by rounded bases; peduncles densely strigose or appressed-hispidulous; mature calyx ca. 3 mm. long, narrowly ovoid, sessile, densely puberulent, teeth lanceolate and connivent; corolla white (?); limb spreading, ca. 3.5 mm. broad; lobes ca. 1.5 mm. long, ovate, very pubescent outside; tube ca. 2 mm. long, cylindrical, ca. 1.3 mm. thick, appressed-pubescent outside, glabrous within; throat densely villous along horizontal plaits; filaments attached at about middle of tube, filiform, ca. 0.5 mm. long; anthers ca. 0.4 mm. long, oblong; mature nutlet 2.5–3 mm. long, narrowly ovoid, back rounded, densely covered with minute very low lucid tuberculations, dulled, with the strong anterior keel suprabasally drawn out into a stout terete abruptly deflexed stipe; style reaching to about half height of nutlet; stigma deeply bilobed.—Contr. Gray Herb. lxx. 13 (1924). *Anchusa Sellowiana* Cham. Lin-

naea viii. 115 (1833); A. DC. Prodr. x. 51 (1846). *Mortizia Sellowiana* Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63, t. 10, fig. 14 (1857).

BRAZIL: no locality given, *Sellow* (US, ISOTYPE).

4. **Moritzia** DC.

Calyx cylindrical or ovoid, toothed, in age accrescent, sessile or pedicellate, ribs armed with stout uncinate hairs. Corolla with tube cylindrical, equalling or surpassing the calyx; lobes triangular or ovate to oblong, spreading, imbricate, obtuse; throat with hairy spots or hairy intruded appendages; stamens affixed above middle of tube, filaments 1–2 times length of the oblong partially to definitely exserted anthers. Style filiform, short to long; stigma bilobed. Ovules 4. Nutlets solitary by abortion, erect, ovoid, smooth to muricate, abruptly contracted below with a small basal areola at the lower end of the strong ventral keel. Gynobase flat.—Perennial herbs. Leaves alternate, the basal ones large and tufted, cauline ones relatively small. Inflorescence of bractless peduncled forked unilateral spikes or racemes. Corolla blue.—DC. in Meisner, Gen. i. 280; ii. 188 (1840). *Meratia* A. DC. Prodr. x. 104 (1846).

A very natural genus of Colombia and Venezuela and of southern Brazil. It is obviously most related to *Thaumatocaryon* but differs in habit, inflorescence, pubescence of the calyx, attachment of the nutlets and structures of the corolla-throat.

KEY TO SPECIES.

Style short, 1–2 mm. long, not surpassing the calyx; lowermost calyces evidently pedicellate, the pedicels 2–7 mm. long; leaves with anastomosing usually forked veins; corolla-tube ca. 2 mm. long, about equalling the calyx; stamens included; Colombia and Venezuela . . . . . 1. *M. Lindenii.*

Style long, 5–10 mm. long, much surpassing the calyx; calyces broadly sessile; leaves with simple distinct veins; corolla-tube 4–8 mm. long, surpassing the calyx; stamens short-exserted; Brazil.

Corolla-throat with 5 bearded spots; leaves conspicuously appressed-hispid on both surfaces; stamens inserted in the throat and evidently exserted; filaments ca. 2 mm. long and about twice length of anthers . . . . . 2. *M. Dusenii.*

Corolla-throat with 5 intruded ligulate bearded appendages; leaves minutely strigose or occasionally sparsely hispid below, at first glance apparently glabrous; stamens inserted at about $\frac{1}{3}$ height of tube, protruded but surpassed by the appendages; filaments ca. 0.8 mm. long, about equalling the anthers in length . . . . . 3. *M. ciliata.*

1. **Moritzia Lindenii** (A. DC.) Benth. Perennial; stems several, erect, simple, 3–8 dm. tall, short-strigose, the hairs usually sparse and

retrorse below the middle and abundant and antrorse above, usually also somewhat hispid; leaves acute, appressed short-hirsute with the rib and veins and margins frequently hispid, bicolored, midrib and branching veins prominent beneath and usually impressed above; lower leaves tufted, 15–20 cm. long, 2–2.8 cm. broad, oblanceolate, gradually contracted into a winged petiole, hairs on upper face all with pustulate bases; cauline leaves lanceolate to lance-oblong, 3–5 cm. long, 8–15 mm. broad, sessile by a rounded base, scarcely reduced up the stem; racemes 2–5 cm. long, disposed in a terminal corymbose panicle; mature calyx ovoid-cylindrical, ca. 4 mm. long, ca. 2 mm. thick, densely armed with coarse uncinate hairs arising from coarse tuberculate bases, more or less pentangular, with 5 erect triangular lobes ca. 1 mm. long; pedicels densely appressed short-hispid, upper ones 1–2 mm. long, the lowermost somewhat longer becoming as much as 7 mm. long; corolla blue, with a very fine tuberculate-mealy surface; limb spreading, 6–9 mm. broad; lobes semicircular or ovate, rounded, sparsely strigose outside; tube ca. 2 mm. long, slightly ampliated upwards, about equalling the calyx; throat with 5 circular spots very densely bearded with short obese hairs; stamens attached at about ¾ height of tube; anthers oblong, ca. 0.9 mm. long and about twice length of filaments, included in throat or only partially exserted; nutlet ovoid, obscurely angulate, white, densely tuberculate-muricate, 2–2.5 mm. long, abruptly contracted below to the basal attachment; style reaching to about ¾ height of nutlet, 1–2 mm. long.—Benth. acc. Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a, 121 (1893); Johnston, Contr. Gray Herb. lxx. 11 (1924). *Meratia Lindenii* A. DC. Prodr. x. 104 (1846).

VENEZUELA. Mérida: Paramo de la Sal, 3400 m. alt., *Jahn 515* and *592* (US).

COLOMBIA. Cundinamarca: wet mossy paramo, Paramo de Cruz Verde near Bogotá, 3300–3500 m. alt., *Pennell 2052* (G, NY, US). Caldas: moist grassy paramo, Cerro Tatama, alt. 3400–3500 m. alt., *Pennell 10576* (G); forest below Paramo del Quindio, 3500–3800 m. alt., *Pennell & Hazen 10078* (G).

A species of the higher mountains of western Venezuela and northern Colombia. The type is given as from Caracas, Venezuela.

2. **M. Dusenii**, sp. nov. Perennis; caulibus pluribus erectis simplicibus 2.5–3.5 dm. altis minute pubescentibus et hispidis; foliis acutis obscure bicoloribus ubique puberulentis et conspicue adpresse hispidis subtus cum costa et nervis simplicibus prominentibus, foliis basalibus late lanceolatis 1–2 dm. longis 3–5 cm. latis basin versus in petiolum alatum brevem attenuatis, medio-caulinis oblongis vel late lanceolatis 4–5 cm. longis 8–14 mm. latis per basem triangularem

sessilibus; spicis 1–3 cm. longis densifloris paniculatim dispositis; calycibus maturitate cylindricis late sessilibus dense breviterque pubescentibus .et cum setis paucis uncinatis munitis; corolla caerulea extus supra medium pubescenti, limba patenti 8–10 mm. lata, lobis ca. 4 mm. longis oblongis paullo attenuatis ad apicem abrupte obtusis vel obtuse rotundatis extus dense pubescentibus, tubo paullo gradatim ampliato ca. 8 mm. longo 2.5–3 mm. lato calycem valde superanti, faucibus cum locis 5 circularibus dense villosis sed exappendiculatis; staminibus in apicem tubo affixis exsertis, filamentis 2 mm. longis, antheris oblongis ca. 1 mm. longis; nuculis maturis ignotis; stylo longo gracili 8–10 mm. longo.

BRAZIL. PARANÁ: campo, Curityba, 900 m. alt., Oct. 30, 1915, *Dusén 17273* (G, TYPE).

A very distinct species which is somewhat intermediate between *M. ciliata* and *M. Lindenii* but clearly most related to the former. It agrees with *M. Lindenii* in having merely bearded spots in the throat rather than ligulate bearded intruded appendages. With *M. ciliata* it agrees in having broadly sessile calyces armed with few uncinate hairs, in its long corolla-tube and style, and in its simply nerved leaves the cauline ones of which are strongly reduced up the stem. From its close relative it differs in having much less distinctly bicolored leaves, both surfaces of which are conspicuously and uniformly appressed-hispid. Furthermore the hairs on the upper surface of the foliage are provided with evident discoid bases. The lower leaves, also, are broader, shortly stalked and widest at about the middle. The corolla differs in its larger size and in having an unappendaged throat, from which develop longer more protruding filaments. I have seen no authentic material of *M. ciliata*, var. *hirsuta* Fresen., Mart. Fl. Brasil. viii. pt. 1, 63 (1857), which is described as differing from typical *M. ciliata* in being densely strigose on both leaf-surfaces and coarsely hirsute on stems and peduncles. This variety was based upon a collection by Sellow cited as from "Brasil." Possibly it is based upon material referable to *M. Dusenii*.

3. **M. ciliata** (Cham.) DC. Perennial; stems several, erect, simple, 3–4 dm. tall, with a short pubescence obscured by a shaggy white coat of much longer hispid-villous hairs; leaves acute, minutely strigose and below sparsely hispid on midrib and veins, conspicuously ciliate on margins, noticeably bicolored, none of the pubescence with discoid bases, veins unbranched; lower leaves 1.5–3 dm. long, 2.5–3.5 cm. broad, oblanceolate, gradually contracted into a long winged stalk; cauline leaves lanceolate to linear with middle ones 4–6 cm.

long and 8–12 mm. broad, sessile by a rounded base, strongly reduced up the stem; spikes 1–3 cm. long, very dense, paniculately disposed; mature calyx cylindrical, ca. 5 mm. long, 2 mm. thick, densely short pubescent, along the angles occasionally with a few stout uncinate hairs, broadly sessile, lobes blunt, triangular and ca. 1 mm. long; corolla blue; limb spreading, 4–5 mm. broad; lobes triangular, blunt, densely pubescent outside; tube 4–5 mm. long, weakly dilated upwards evidently surpassing the calyx; throat with 5 very villous ligulate intruded appendages 1–1.5 mm. long; stamens at about $\frac{4}{5}$ height of tube; anthers narrowly oblong, ca. 0.8 mm. long and about equalling the filaments in length, exserted, reaching almost to the tip of the appendages; nutlet obliquely subovoid, 2.5–3 mm. long, pale, shiny, contracted to a stout stipitate base; style 5–7 mm. long, greatly surpassing the corolla as well as fruit.—DC. in Meisner, Gen. ii. 188 (1840); DC. Prodr. x. 56 (1846); Fresen. in Mart. Fl. Brasil. viii. pt. 1, 63, t. 10, fig. 13 (1857); Gürke in E. & P. Nat. Pflanzenf. iv. Abt. 3a. 121, fig. 47 l-m (1893); Johnston, Contr. Gray Herb. lxx. 11 (1924). *Anchusa ciliata* Cham. Linnaea iv. 440 (1829).

BRAZIL. Rio Grande do Sul: open woods, Puerto Alegre, *Reineck* (G). Indefinite: without locality, *Sellow 672* (US, isotype).

5. **Echium** [Tournef.] L.

Calyx 5-parted with linear or lanceolate segments. Corolla tubular-funnelform, oblique and irregular; lobes imbricate, ascending, unequal; throat naked, broad and gaping; stamens inserted low in the tube, usually unequal and exserted; anthers ovate or oblong, on slender filaments. Style filiform, usually exserted, commonly bilobed; stigmas 2, small. Ovules 4. Nutlets 4, erect, rugose or verrucose, ovoid or oblong, with a broad basal areola. Gynobase flat or low-pyramidal.—Herbs or shrubs with alternate leaves. Racemes unilateral, bracteate. Corolla violet to pink or white.—Sp. Pl. 139 (1753) and Gen. Pl. 68 (1754).

A large and complex genus of the Old World with two introduced species in South America.

Key to Species.

Basal leaves ovate or broadly oblong, evidently nerved; upper leaves narrowed from a broad cordate semiamplexicaul base; corolla of delicate texture, glabrous or but sparsely setose ..... 1. *E. plantagineum*.

Basal leaves oblanceolate, very obscurely if at all nerved; upper leaves narrowed to a rounded base; corolla of firmer texture, pubescent as well as setose ..... 2. *E. vulgare*.

1. **Echium plantagineum** L. Biennial, stems erect or ascending, one to several, 3–8 dm. tall, branched from base, appressed hispid-villous and sometimes sparsely hispid; leaves appressed-hispid, the lower ones 8–16 cm. long, oblong-ovate, petiolate, with strong midrib and evident veins, usually persistent at anthesis, the cauline ones strongly reduced up the stem, oblong, narrowed from a broad cordate semiamplexicaul base; racemes elongate, loosely disposed; corolla violet-blue, 2–3 cm. long, rather delicate in texture, glabrous or sparsely setose, tube shorter than the calyx; stamens with a pair conspicuously exserted, a pair almost as long as the lower corolla-lobe and an odd one definitely included; nutlets ca. 2.5 mm. long.—Mant. Alt. 202 (1771); St. Hil. Pl. Usuel. Brasil. t. 25 (1825); Fresen. in Mart. Fl. Brasil. viii. pt. 1, 61 (1857); Arech. Anal. Mus. Nac. Montevideo ser. 1, vii (Fl. Urug. iv.) 182 (1911); Johnston, Contr. Gray Herb. lxx. 10 (1924). *E. violaceum* of authors; Lacaita, Jour. Linn. Soc. xliv. 421 (1919). *E. bonariense* Poir. Encyc. viii. 674 (1808); Lehm. Asperif. ii. 462 (1818). *E. violaceum*, var. *medium* Kuntze, Rev. Gen. iii. pt. 2, 204 (1898).

ARGENTINA. BUENOS AIRES: Barracas al Sur, Oct. 1902, *Venturi 73* (G); Sierra de Ventana, *Hauthal 57* (NY, TYPE of *E. violaceum*, var. *medium*); Buenos Aires, *Parker* (G); Azul, Nov. 1887, *Osten* (G). ENTRERIOS: Concepcion del Uruguay, Nov. 1875, *Lorentz* (G).
URUGUAY. MONTEVIDEO: Pocitos Malvin, Feb. 1924, *Herter 80a* (G); Montevideo, 1838, *Isabelle* (NY).

Widely introduced over temperate South America west of the Andes. It has been reported from southern Brazil, Uruguay and central and northern Argentina. The species was introduced into the Argentine apparently at a very early date, since Poiret described his *E. bonariense* in 1808 basing it upon material collected at Buenos Aires by Commerson in 1767.

2. **E. vulgare** L. Biennial; stems erect, solitary or occasionally several, 3–9 dm. tall, finely hispid-villous as well as shaggy coarse-hirsute; leaves appressed-hispid and along the margin and midrib somewhat hirsute, with a strong midrib but very obscure or absent veins; lower leaves 8–16 cm. long, oblanceolate, broadly stalked, forming a rosette which withers away at anthesis; cauline leaves reduced up the stem, the middle ones linear-lanceolate, 3–9 cm. long, contracted to a rounded sessile base; racemes short, lateral, disposed in a long narrow thyrse or open panicle; corolla bright blue, rarely rose or white, pubescent and sparsely setose, rather firm in texture, 10–15 mm. long, tube about equalling the calyx; stamens very unequal, the two pairs slightly unequal but both surpassing the lower

corolla-lobe, the odd stamen included; nutlets ca. 2 mm. long.—Sp. Pl. 139 (1753); Reiche, Anal. Univ. Chile cxxi. 835 (1908) and Fl. Chile v. 240 (1910); Johnston, Contr. Gray Herb. lxx. 10 (1924).

CHILE. Valdivia: Antilhue, 1916, *Baeza* (IP). Malleco: Collipulli, 1915, *Baeza* (IP). Concepcion: Cabrero, 1913, *Baeza* (IP). Ñuble: Alico, 1878, *Puga* (MS). Santiago: Mapocho, 1909, *Rudolph* (IP).

This European weed is apparently widely dispersed over south-central Chile. It is to be expected from the Argentine though I have seen no specimens from there. Various authors have reported the species in that country but from their discussions it seems probable that the records are in large part, at least, based upon misdeterminations of *E. plantagineum*.

II. Tribe Anchuseae.

Nutlets erect or oblique or horizontal, straight or curved, smooth or rugose; areola basal or lateral, along the side or near tip of cotyledons, surrounded by a tumid annular rim, strophiolate, more or less plug-shaped or rarely merely high-convex; gynobase usually convex, commonly with broad cavities left by the strophiolate plugs; style lobed or simple; stigmas 1 or 2, distinct or almostly completely fused; corolla blue or rarely white or yellow.—Johnston, Contr. Gray. Herb. lxxiii. 52 (1924); Gusuleac, Pub. Soc. Nat. România no. 6, 1–16 (1923).

This tribe is native of the Old World and is represented in America only by introduced species.

Key to Genera.

Stamens unappendaged, erect, distinct; corolla-tube well developed.....6. *Anchusa.*
Stamens appendaged dorsally; anthers connivent; corolla-tube very short.....7. *Borago.*

6. **Anchusa** L.

Calyx 5-toothed or -parted. Corolla regular or slightly zygomorphic; tube straight or bent, cylindrical; lobes spreading, imbricate; throat with oblong or deltoid usually hairy intruded appendages; stamens affixed at middle of tube, included. Style filiform. Stigma solitary and emarginate or geminate. Ovules 4. Nutlets 4, erect, oblique or incurved, usually rugose; areola basal or suprabasal, surrounded by a thick annular rim, prolonged down as a strophiolate plug. Gynobase flat or low-convex.—Annual or perennial herbs, hirsute to villous. Leaves alternate. Corolla bluish purple to white or rarely pink. Inflorescence bracteate.—Sp. Pl. 133 (1753) and Gen.

Pl. 64 (1754). *Lycopsis* L. Sp. Pl. 138 (1753) and Gen. Pl. 68 (1754).

A large genus the distribution of which centers in the Mediterranean region.

KEY TO SPECIES.

Corolla regular, with straight tube and horizontal limb...1. *A. officinalis.*
Corolla irregular, with bent tube and oblique limb.....2. *A. arvensis.*

1. **Anchusa officinalis** L. Biennial; stems erect, 3–6 dm. tall, simple or ascendingly long-branched, hispid; leaves scabrous, short-hispid, with straight or obscurely undulate margins; lower leaves lanceolate, acute, attenuate into a long winged petiole, 1–2 dm. long; middle leaves oblong to oblong-lanceolate, tapering from a broad rounded or cordate base; racemes solitary or geminate, 5–20 cm. long, dense; mature calyx globose, appressed-hispid, with short narrowly triangular lobes; pedicels 1–2 mm. long; corolla regular, purple, salverform, the limb concave, not oblique, 5–8 mm. broad, tube 3–6 mm. long, straight, surpassing the calyx; nutlets very strongly incurved, depressed, rugose, 3–4 mm. long.—Sp. Pl. 133 (1753); Johnston, Contr. Gray Herb. lxx. 9 (1924).

ARGENTINA. BUENOS AIRES: Núñez, Feb. 1919, *Molfino* (G).

This European species appears to have been introduced in South America only in Argentina. Berg, Anal. Soc. Cient. Argent. iii. 198 (1877), reported its presence in the vicinity of Buenos Aires fifty years ago.

2. **A. arvensis** (L.) Bieb. Annual; stems coarse, shaggy coarse-hirsute, ascendingly long-branched from the base, 1–6 dm. tall; leaves hirsute, pustulate, margins undulate or denticulate; lower stem-leaves oblanceolate, 5–15 cm. long, contracted into a winged petiole; middle and upper cauline leaves broader, oblong or oblong-lanceolate, with a broad rounded clasping base; racemes solitary or geminate, 5–15 cm. long; mature calyx cut nearly to base into hirsute lanceolate lobes; pedicels 2–4 mm. long; corolla zygomorphic, salverform, blue, tube longer than the calyx, 4–5 mm. long, bent above the middle, limb concave, oblique, 4–6 mm. broad; nutlets strongly incurved, rugose, 3–4 mm. long.—Fl. Taur.-Cauc. i. 123 (1808); Gusuleac, Pub. Soc. Nat. România no. 6, 13 (1923). *Lycopsis arvensis* L. Sp. Pl. 139 (1753); Clos in Gay, Fl. Chile iv. 477 (1849); Johnston, Contr. Gray Herb. lxx. 8 (1924).

I have seen no material of this Old World species from South America. Although to be expected there I have found only one def-

inite record attributing the species to South America, this made long ago by Hooker & Arnott, Bot. Beechey Voy. 37 (1830), who reported it as introduced at Valparaiso, Chile.

7. **Borago** [Tournef.] L.

Calyx 5-parted. Corolla rotate or very broadly campanulate; tube very short; lobes imbricate, acute; throat appendaged; stamens inserted on the tube, exserted; filaments broad, prolonged as an appendage beyond the insertion of the linear connivent anthers. Style filiform. Stigma emarginate. Ovules 4. Nutlets 4, ovoid or oblong, erect; areola with conspicuous annular rim surrounding the strophiolate plug. Gynobase flat or weakly convex.—Annual or perennial hirsute herbs with alternate leaves.—Sp. Pl. 137 (1753) and Gen. Pl. 67 (1754).

A small very natural genus of the Mediterranean region.

1. **Borago officinalis** L. Annual; stems usually coarse, erect or ascending with spreading branches, 3–6 dm. tall, coarsely shaggy-hirsute; leaves coarse, veiny, sparsely appressed-hispid and setose-hirsute, scabrous; lower leaves obovate or oblong, contracted into a long coarse winged petiole, blade 1–1.5 dm. long; middle leaves narrower, with the shorter winged petioles eared at base; upper leaves sessile; flowers in loose racemes usually corymbosely disposed; mature calyx hirsute, 1–2 cm. long, cut into erect or ascending lanceolate lobes; pedicels very long, hirsute, 2–4 cm. long; corolla clear blue, rotate, 1.8–2.4 cm. broad, lobes ovate and acute or acuminate; stamens dark and very conspicuous; nutlets 5–6 mm. long, on sides finely ribbed longitudinally, tuberculate at summit.—Sp. Pl. 137 (1753).

ECUADOR. Guayaquil, *Rose 22102* (G).
BOLIVIA. La Paz, *Bang 38* and *129* (G).
CHILE. Copiapó, *Gigoux* (G).

A medicinal plant, widely cultivated in herb-gardens in Latin America, and occasionally appearing as an escape.

III. Tribe Eritrichieae.

Nutlets erect or suberect or rarely horizontal, straight or slightly bent, smooth or roughened or appendaged, margined or immarginate; areola lateral or basal, at side of cotyledons or near their tips; gynobase pyramidal or columnar or rarely flat; style entire; stigma 1, entire or emarginate, capitate or disciform; corolla blue or white or less commonly yellow or orange.—Johnston, Contr. Gray Herb. lxxiii. 57 (1924).

This large tribe centers in Asia and western America. Brand, Fedde Repert. xxi. 249 (1925), has recently substituted the name *Cryptantheae* for the well established tribal name, *Eritrichieae*, arguing that the latter is inappropriate since the genus *Eritrichium* is now considered a small genus and since it is not characteristic of the tribe. I am maintaining the old tribal name as it has had wide use since it appeared in Bentham & Hooker's Genera, ii. 836, in 1876, and because Brand's arguments if applied consistently to *Borago* and the family and subfamily names would destroy several of the major nomenclatorial landmarks in the family.

Key to Genera.

Corolla-lobes contorted in the bud; nutlets smooth, basally affixed; stigma disciform.....8. *Myosotis.*
Corolla-lobes imbricate in the bud.
  Nutlets with a definite medial ventral groove formed by the non-fusion of the pericarpial walls.-
    Corolla-tube at base within naked or with small scales; mature calyx cut to beyond the middle and commonly to the base; bracts present or absent, always distinct from the calyx.....9. *Cryptantha.*
    Corolla-tube below middle within provided with 5 pairs of elongate vertical knife-like lamellae; mature calyx decidedly cylindrical, merely toothed; bracts decurrent on and coalescent with the lower part of calyx 10. *Nesocaryum.*
  Nutlets with the pericarpial walls fused at least above the middle and commonly forming a medial ventral keel.
    Back of nutlets not encircled by a flange or row of appendages.
      Corolla white, appendaged in the throat; cotyledons entire.....11. *Plagiobothrys.*
      Corolla orange or yellow, unappendaged in the throat; cotyledons 2-lobed.....12. *Amsinckia.*
    Back of nutlets encircled by a toothed or lacerate rim or flange or by a row of subulate glochidiate appendages.
      Nutlets equalling the subulate gynobase, attached for nearly their whole length along the crest of the ventral keel, lacking a definite areola; style usually clearly surpassing the nutlets; racemes bracted.....13. *Lappula.*
      Nutlets twice surpassing the stout pyramidal gynobase, attached obliquely supramedially by a deltoid or ovate areola.
        Plant an herb; pedicels recurved in fruit; leaves herbaceous; continental.....14. *Hackelia.*
        Plant a shrub; pedicels erect in fruit; leaves firm; insular.....15. *Selkirkia.*

8. **Myosotis** [Dill.] L.

Calyx cut to beyond the middle into lanceolate or triangular lobes. Corolla with short tube; lobes contorted, rounded, spreading; throat

with intruded appendages; stamens affixed on tube, included or exserted, the filaments filiform; anthers oblong or ovate, obtuse. Ovules 4. Nutlets 4, erect, ellipsoid, smooth and shiny, with a basal areola; gynobase flat or high convex. Style filiform. Stigma disciform.—Annual or perennial herbs. Leaves alternate. Racemes bractless or bracted. Corolla blue, white or rarely rose.—Sp. Pl. 131 (1753) and Gen. Pl. 63 (1754).

A large genus centering in the Old World. It is separated from practically all other genera of the subfamily by the contorted rather than imbricate aestivation of the corolla.

Key to Species.

Inflorescence leafy-bracted throughout; prostrate indigenous species of extreme southern South America.
  Plant finely and rather sparsely strigose; corolla-limb 3–4 mm. broad; lobes of mature calyx much longer than the tube; nutlets 1.7–1.9 mm. long.....1. *M. albiflora.*
  Plant appressed short-hispid; corolla-limb ca. 2.5 mm. broad; lobes of mature calyx much shorter than tube; nutlets 1–1.3 mm. long.....2. *M. antarctica.*
Inflorescence bractless or occasionally bracted at the base.
  Corolla white, 1–1.5 mm. broad; calyx slightly irregular; small erect plants of dryish soil.....3. *M. virginica.*
  Corolla blue, 3–9 mm. broad.
    Calyx densely strigose and also with uncinate hairs, slightly irregular; stems shaggy and retrorsely hispid towards base; plants of well drained soils.....4. *M. azorica.*
    Calyx sparsely strigose, lacking uncinate hairs, regular; stems glabrate or sparsely antrorse-strigose towards base; aquatic or marsh plants.
      Corolla large, 5–9 mm. broad; style commonly much surpassing the nutlets; nutlets angled on ventral face; racemes usually completely bractless....5. *M. scorpioides.*
      Corolla small, 3–6 mm. broad; style commonly surpassed by the nutlets; nutlets convex on ventral face; racemes usually bracted at base.....6. *M. laxa.*

1. **Myosotis albiflora** Banks & Solander. Perennial from a short rhizome; stems several, slender, prostrate or loosely ascending, short-strigose, leafy; leaves light green, thin, sparsely short-strigose; lower leaves 1–5 cm. long, 3–8(–10) mm. broad, broadly oblanceolate, petiolate; upper leaves obovate, reduced and continuing as bracts through the inflorescence; flowers in leafy false racemes, usually extra-axillary and opposite or beside or between the bracts; calyx sparsely strigose, lacking uncinate pubescence, at maturity cleft into lanceolate ascending lobes; pedicels slender, usually not longer than the calyx; corolla white with yellow appendages, tube cylindrical and about equalling the calyx, limb widely spreading, 3–4 mm. broad; nutlets grayish, 1.7–1.9 mm. long, back low-convex, face strongly angled; style a

little shorter than the nutlets.—Hook. f. Fl. Antarct. ii. 329 (1846); Clos in Gay, Fl. Chile iv. 461 (1849); Reiche, Anal. Univ. Chile cxxi. 834 (1908) and Fl. Chile v. 239 (1910); Skottsb. Svenska Vet. Akad. Handl. lvi. pt. 5, 290, t. 23, fig. 8a, c (1916); Johnston, Contr. Gray Herb. lxx. 41 (1924). *Eritrichium albiflorum* Griseb. Abh. Gess. Wiss. Goett. vi. 131 (1854); Ph. Anal. Univ. Chile xc. 515 (1895). *Allocarya albiflora* Greene, Erythea iii. 57 (1895).

CHILE. MEGALLANES: prostrate on beach at Puerto Americano, Chonos Island, lat. 45° S., Jan. 1857, *Fonck 118* (MS); Fortune Bay, Isla Baverstock, lat. 52° 15′ S., Jan. 9, 1879, *collector not given* (MS); Porvenir, Fuegia, lat. 53° 30′ S., *Dusén 267* (G, MS); Rio Azopardo, Fuegia, lat. 54° 27′ S., March 1896, *Dusén 593* (G, MS); forest region, Navarin Island, lat. 55° S., Jan. 1920, *Gusinde 253* (G).

The type material of this species came from Bahia Good Luck in the western part of the Straits, lat. 53° 28′ S., and from southern Fuegia. Skottsberg, l. c., reports the species from Puerto Ramirez in Canal Smythe, lat. 52° 20′ S., Caleta Cutter in Canal Jeronimo, lat. 53° 20′ S., and Puerto Fortuno on Isla Londonderry, lat. 54° 53′ S., all in Megallanes. He also reports it from Estancia Mayer, lat. 51° 17′ S., which is on the Rio Coile in Santa Cruz in extreme southern Argentina. The species was very poorly understood and much confused until Skottsberg published his notes concerning it. Spegazzini apparently confused it with *M. virginica*, Dusén did not distinguish it from *M. antarctica* and Grisebach and authors following him mistook it for *Plagiobothrys calandrinioides*.

2. **M. antarctica** Hook. f. Annual or perennial; stems several to many, prostrate or decumbent, stiffish, appressed short-hispid, leafy, internodes short; leaves dark green, appressed short-hispid, obtuse or rounded at apex; basal leaves broadly spathulate, 1–2 cm. long, 3–6 mm. broad; upper leaves reduced, oblong-obovate, broadly affixed, continuing as bracts through the inflorescence; flowers in leafy false racemes, usually extra-axillary and beside or between or opposite the bracts; calyx loosely appressed short-hispid, at maturity with erect lanceolate lobes much shorter than the ribbed campanulate tube; pedicels short; corolla white or bluish with yellowish appendages, tube about equalling the calyx or surpassing it, limb spreading, ca. 2.5 mm. broad; nutlets small, 1–1.3 mm. long, dark, back convex, face obtuse; style surpassing the nutlets.—Fl. Antarct. i. 57, t. 38 (1844) and Handb. N. Zealand Fl. 193 (1864); Skottsb. Svenska Vet. Akad. Handl. lvi. pt. 5, 291, t. 23, fig. b, d (1916); Johnston, Contr. Gray Herb. lxx. 41 (1924). *M. antarctica*, f. *gracilior* Skottsb, l. c.

I have seen no American material of this species, which has been

well known from New Zealand, Steward Island and Campbell Island in the eastern hemisphere. Skottsberg, l. c., however, who first gave a clear account of its American occurrence, collected it at Puerto Altamirano in Seno Skyring, lat. 52° 33′ S., and mentions material collected at Punta Arenas by Dusén (no. 173) and Lechler (no. 1132, in pt.) and in "Magellans Land" in 1852 by Andersson. Dusén's collection, the type of the forma *gracilior*, has been figured by Dusén, Svenska Exped. Magell. iii. no. 5, 134 (1900) as *M. albiflora*. The species is known from America only from the Chilean mainland just west and north of the Straits of Magellan.

3. **M. virginica** (L.) B. S. P. Annual or biennial, branched from the base, erect, 0.5–4 dm. tall, hispid-villous with the hairs spreading or appressed; leaves appressed hispid-villous, obtuse, the lower ones oblanceolate 1–4(–5) cm. long and 3–9(–12) mm. broad, the upper ones linear or oblong and little reduced; calyx strigose and short-hispid with spreading frequently uncinate hairs, slightly but definitely irregular; calyx-lobes lanceolate, erect or connivent, longer than the tube, the lower one the longest; pedicels slender, at least equalling the length of the calyx, usually erect and appressed to the stem; corolla inconspicuous, white but commonly drying brown, subtubular or salverform with a funnelform throat and ascending lobes, limb 1–2 (–2.5) mm. broad; nutlets grayish, back convex, face obtusely angled above middle and convex below; style very short, much shorter than the nutlets.—Prel. Cat. N. York 37 (1888); Johnston, Contr. Gray Herb. lxx. 43 (1924) and l. c. lxxv. 42 (1925). *Lycopsis virginica* L. Sp. Pl. 139 (1753). *M. verna* Nutt. Gen. ii. add. (1818). *M. versicolor*, var. *americana* A. DC. Prodr. x. 109 (1846). *Eritrichium pampeanum* Speg. Contr. Fl. Sierra Vent. 44 (1896).

ARGENTINA. BUENOS AIRES: common along streamlets in Sierra Ventana, Nov. 14, 1895, *Spegazzini* (G, "COTYPUS" of *E. pampeanum*). CHABUT: hills near Nafofo-chauellu, March 12, 1925, *Spegazzini* (G).

This species, which ranges over the eastern half and the northwestern parts of the United States, is apparently indigenous in northern Patagonia and the Province of Buenos Aires. It appears to be, at least in part, the plant which Spegazzini, Pl. Patag. Aust. 551 (1897), has reported as *Eritrichium albiflorum*. In fact the specimen from Chabut cited above was sent me by Spegazzini as representing an unpublished variety of that species.

4. **M. azorica** H. C. Wats. Plant annual or possibly perennial; stems several, rather coarse, erect or decumbent, simple or with numerous long ascending branches, conspicuously and abundantly

hispid-villous with the hairs sordid or white and decidedly retrorse at least towards base of plant; leaves sparsely appressed villous-strigose; lower leaves broadly oblanceolate or obovate-oblanceolate, 3–6(–10) cm. long, 10–20(–25) mm. broad, petiolate; upper leaves gradually reduced, oblong-elliptic or ovate-lanceolate; racemes solitary or geminate, bractless or leafy-bracted towards base; calyx densely strigose and with spreading uncinate hairs, slightly but definitely irregular; calyx-lobes lanceolate, erect, longer than the tube, the lower one the longest; pedicels slender, longer than the calyx; corolla blue, 5–7 mm. broad, limb flat; nutlets shiny black, back convex, face strongly angled and keeled; style reaching to the tip of the nutlets or just beyond.—Bot. Mag. lxx. t. 4122 (1844).

COLOMBIA: cultivated in Bogotá, 1876, *Bayon* (US).
BOLIVIA: hillsides, escaped, canyon of La Paz River, 1920, *Shepard 174* (G, US).
CHILE: cultivated, Copiapó, 1886, *Gigoux* (G); cultivated, Santiago, 1886, *Gigoux* (G); Valdivia, 1896, *Buchtien* (US).

This is the cultivated "no-me-olvides" of South American gardens. For a discussion of the status of the name, *M. azorica*, see note by Johnston, Contr. Gray Herb. lxx. 42 (1924). Although the name is unquestionably applicable to the plant treated here, there are several older but still obscure names that are probably synonymous and perhaps some one of them may be sufficiently verified to displace it.

5. **M. scorpioides** L. Perennial; stems ascending from a trailing or creeping rhizomatous base, rooting at the nodes, 2–8 dm. long, subsimple or loosely branched above, usually obscurely angulate, rather sparsely short-strigose; leaves sparsely strigose, the lower ones oblanceolate or spathulate, 4–8 cm. long, 8–12(–20) mm. broad, the upper ones gradually reduced and becoming linear-lanceolate to linear oblong; racemes geminate or solitary, almost always bractless; calyx sparsely strigose, lacking uncinate hairs, usually with deltoid lobes shorter than the tube; pedicels slender, longer than the mature calyx; corolla blue with yellow appendages, the limb flat, 5–9 mm. broad; nutlets convex dorsally, somewhat obtuse ventrally; style commonly much surpassing the nutlets, usually reaching to level of the calyx-sinuses.—Sp. Pl. 131 (1753); Rendle & Britt. Jour. Bot. xlv. 440 (1907); Johnston, Contr. Gray Herb. lxx. 41 (1924). *M. scorpioides*, var. *palustris* L. l. c. *M. palustris* Lam. Fl. Fr. ii. 283 (1778).

CHILE. Chiloe: wet grassy ditch behind beach, Ancud, Feb. 1925, *Pennell 12523* (G).

A native of Europe, widely introduced in wet places in temperate North America. Now first reported from South America.

6. **M. laxa** Lehm. Annual or soboliferous perennial; roots fasciculate and fibrous; stems slender, erect or decumbent, solitary, loosely branched commonly from the base, terete, sparsely strigose; leaves sparsely strigose, the lower ones oblanceolate or spathulate, 3–6(–8) cm. long, 6–10(–12) mm. wide, the upper ones gradually reduced, narrowly linear-lanceolate or linear-oblong; racemes geminate or solitary, with the principal one leafy-bracted just above the base; calyx sparsely strigose, lacking uncinate hairs, usually with narrowly ovate-triangular or almost cuneate lobes about equalling the tube in length; pedicels slender, longer than the mature calyx; corolla light-blue with yellow appendages, limb slightly concave, 3–6 mm. broad; style usually shorter than the nutlets and reaching much below the level of the calyx-sinuses.—Asperif. i. 83 (1818); Johnston, Contr. Gray Herb. lxx. 41 (1924) where further synonymy.

ARGENTINA. Buenos Aires: vicinity of Buenos Aires, 1913, *Rodriquez 167* (G).
CHILE. Valdivia: Valdivia, 1899, *Buchtien* (US).

A native of Europe and North America, but probably introduced in South America.

Doubtful or Excluded Species.

M. foliosa Lehm. Asperif. i. 99 (1818).—"America meridionalis"—Probably a species of *Lithospermum* and perhaps the same as the next.

M. grandiflora HBK. Nov. Gen. et Sp. iii. 90, t. 199 (1818).—Although given as from Ecuador this appears to be Lithospermum distichum Ort. and to have come, in fact, from Mexico, cf. Johnston, Contr. Gray Herb. lxxv. 40 (1925).

9. **Cryptantha** Lehm.

Calyx usually cut to the base, the lobes erect or connivent, linear or oblong. Corolla with usually a short cylindrical tube, with or without scales at the base inside; lobes imbricate, rounded, spreading; throat with intruded appendages. Style slender, short or long, included; stigma capitate. Ovules 2–4. Nutlets 1–4, erect, ovate to triangular, roughened or smooth, margined or marginless, affixed laterally through a medial ventral and commonly basally forked groove to a usually columnar subulate or pyramidal gynobase.—Annual or perennial herbaceous or fruticulous plants, usually with coarse stiff pubescence. Leaves opposite at base, firm, veinless. Flowers white or very rarely yellow, in bractless or bracted spikes or racemes. Mature calyx in-

vesting the nutlets and falling away as a bur or persistent with the nutlets falling away individually.—Del. Sem. Hort. Hamburg iv. (1833); Don. Gen. Syst. iv. 373 (1837). *Krynitzkia* F. & M. Ind. Sem. Hort. Petrop. vii. 52 (1841). *Piptocalyx* Torr. in Wats. Bot. King Exped. 240 (1871). *Oreocarya* Greene, Pittonia i. 57 (1887). *Eremocarya* Greene, Pittonia i. 58 (1887). *Greeneocharis* Gürke & Harms in E. & P. Nat. Pflanzenf., Gesamtreg. 462 (1899). *Wheelerella* Grant, Bull. So. Calif. Acad. v. 28 (1906). *Johnstonella* Brand in Fedde, Repert. xxi. 249 (1925).

One of the largest and most perplexing genera of the *Boraginaceae*. It is exclusively American. About two-thirds of the approximately 150 species occur in western United States. In South America the genus is most abundant in Chile with outlying species in Peru, Bolivia and Argentina.

As here defined, the genus includes the North American group of coarse perennials current as *Oreocarya*. My study of the South American species of *Cryptantha* has convinced me that the recognition of *Oreocarya* has been most arbitrary. That group appears to consist merely of the more or less coarse persistent members of *Cryptantha* § *Krynitzkia*. I am convinced that the characters of the sections of *Cryptantha* defined below are much more fundamental than are such "generic" characters as coarseness of habit and persistence of root which must be stressed in justifying the continued maintenance of *Oreocarya*. I do not believe that *Oreocarya* should be recognized unless the primitive, coarse, persistent species and the more evolved, slender, annual ones in the three sections of *Cryptantha* each be given generic recognition. Personally I do not approve of, and certainly will not be responsible for the segregation of 5 weak genera from the currently accepted *Cryptantha* simply to give logical justification for the maintenance of any mere habit-genus as indefinite as *Oreocarya*.

Key to Sections.

Plants not producing cleistogamic flowers; North and South America ..... I. § *Krynitzkia* (spp. 1–22).

Plants producing cleistogamic flowers; South America.

Cleistogamic flowers simple, borne in the middle and upper or frequently in all the leaf-axils, occasionally replacing the chasmogamic flowers in the inflorescence proper. II. § *Eucryptantha* (spp. 23–30).

Cleistogamic flowers highly specialized, appearing as persistent ovoid or lenticular structures (cleistogenes) borne at the base of the plant below or just above the surface of the ground ..... III. § *Geocarya* (spp. 31–40).

I. Section Krynitzkia.—This is the largest and most difficult section of *Cryptantha* and is distinguished from the other two sections

of the genus by the complete lack of cleistogamic flowers. It reaches its maximum development in North America, where it is represented by about 100 species. There can be little doubt that in the section are found the most primitive members of the genus. One species, *C. albida*, occurs in both North and South America. The only other approach to this condition is the case of *C. parviflora*. This species, while evidently separable, is very closely related to the North American *C. Grayi* and *C. angustifolia*. The species assembled in the series *Barbigerae* are as a group clearly related to those North American species I have collected under that heading, cf. Contr. Gray Herb. lxxiv. 60–69 (1925). It is interesting to note that whereas the short style overwhelmingly predominates among the North American species of the section, the long style is somewhat more common among the southern members. In North America there are numerous species with smooth polished nutlets; in South America there are only four, all closely related and quite different from the northern forms. *Cryptantha gnaphalioides* is a peculiar shrubby perennial, which would be refered to the genus *Oreocarya* if it grew in North America. In other than its habit, however, it is much like *C. dichita*, *C. hispida* and *C. phaceloides*, species which in some regards are reminiscent of the Californian *C. mohavensis*.

Key to Species.

Nutlets perfectly smooth and shiny, large, 2.8–3.3 mm. long. Chile.
- Plant perennial, shrubby at base. *Gnaphalioides*. . . . 1. *C. gnaphalioides.*
- Plant an annual herb. *Phaceloides.*
  - Corolla 7–10 mm. broad; leaves 7–13 mm. broad. . . . . 2. *C. dichita.*
  - Corolla 4–7 mm. broad; leaves 2–3 mm. broad.
    - Nutlets 2. . . . . 3. *C. hispida.*
    - Nutlets 4. . . . . 4. *C. phaceloides.*

Nutlets more or less roughened and dull.
- Nutlets thick with deep plane sides, not crowded, only impinging on one another close to the gynobase and hence separated by open re-entrant sinuses, anterior face occupied by a large triangular (apparently) excavated areola; gynobase narrowly pyramidal; northern Argentina. *Albidae*. . . . . 5. *C. albida.*
- Nutlets strongly compressed with angulate or rounded edges, crowded and closely juxtaposed, not separated by open broad sinuses, anterior face with a very small shallow areola; gynobase subulate.
  - Edges of nutlets sharp, with a definite thin margin; abaxial nutlet more or less emphasized, usually largest and most persistent. *Angustifoliae.*
    - Nutlet homomorphous, 1–1.5 mm. long; spikes bracted throughout; Argentina. . . . . 6. *C. diplotricha.*
    - Nutlets heteromorphous, 0.6–1 mm. long; spikes bractless or bracted at base only; Chile and Peru. . 7. *C. parviflora.*

Edges of nutlets merely angled or rounded, not sharp, mostly marginless but more or less thickly margined in a few species; axial nutlet more or less emphasized, usually the largest or most persistent. *Barbigerae.*
Corolla evident or conspicuous, 2–7 mm. broad.
Spikes bractless; Chilean.
Plant persistent, a perennial or long-lived annual; stems becoming prostrate or trailing.
Plant loosely branched, forming a loose broad open mat, pubescence canescent; corolla 5–6 mm. broad.....8. *C. subamplexicaulis.*
Plant densely branched, forming a dense cushion, pubescence silvery; corolla 2–4 mm. broad.9. *C. argentea.*
Plant a short-lived annual; branches short, erect or ascending.
Nutlets homomorphous, obscurely roughened 10. *C. chaetocalyx.*
Nutlets heteromorphous, definitely tuberculate or papillate.....11. *C. filiformis.*
Spikes bracted.
Corolla 2–4 mm. broad; nutlets homomorphous or heteromorphous, 1.3–1.8 mm. long.
Style much surpassing the 4 nutlets; Peru....12. *C. granulosa.*
Style shortly surpassing the 2–4 nutlets; Chile. 13. *C. talalensis.*
Corolla 5–6 mm. broad; nutlets homomorphous, ca. 2 mm. long; Chile.....14. *C. Romani.*
Corolla inconspicuous or minute, 0.5–1.5(–2) mm. broad.
Spikes bracted; style noticeably surpassing the nutlets.
Fruiting calyx 3–4 mm. long, with narrow erect or slightly spreading lobe-tips; Chile and southern Peru.....15. *C. filaginea.*
Fruiting calyx 5–6 mm. long, with broad decidedly spreading lobe-tips; Peru.....16. *C. limensis.*
Spikes bractless; style equalling the nutlet or just surpassing them.
Nutlets obscurely tuberculate or almost smooth.
Fruiting calyx 8–11 mm. long; nutlets lanceolate, 2.8–3.2 mm. long; plant coarse shaggy-hirsute; Andes of northern Chile.....17. *C. calycina.*
Fruiting calyx 2–3 mm. long; nutlets lance-ovate, ca. 2 mm. long; plant finely strigose or appressed short-hispid; Patagonia.....18. *C. patagonica.*
Nutlets definitely tuberculate or wrinkled.
Back of nutlets tuberculate, coarsely if at all transversely grooved.
Fruiting calyx 2.5–3 mm. long, lobes lance-linear or narrowly lanceolate; Peru.....19. *C. peruviana.*
Fruiting calyx 3–4 mm. long, lobes linear or lance-linear; Chile and Argentina.. .20. *C. globulifera.*
Back of nutlets with transverse lineate grooves.
Spikes very tawny; fruiting calyx 3–4 mm. long; plant stiff; Chile and Argentina....21. *C. diffusa.*
Spikes green; fruiting calyx 2–2.5 mm. long; plant weak; Bolivia.....22. *C. debilis.*

1. **Cryptantha gnaphalioides** (A. DC.) Reiche. Perennial, 2–4 dm. tall, becoming much branched and shrubby, commonly decidedly

woody towards the base; stems erect, closely white-strigose and frequently sparsely hirsute also, cottony-strigose towards base, older parts with exfoliating bark; leaves linear to lance-linear, broadly attached, 1–4(–6) cm. long, 1.5–2.5(–3) mm. broad, obtusish or acutish, more or less strigose and frequently somewhat hirsute, usually canescent, spreading, abruptly reduced above, with leaf-buds or fasciculate leaves in the axils, bases more or less persistent; racemes unbracted, geminate, 1–4 cm. long, not loose, pedunculate; fruiting calyx tardily deciduous, oblong-ovate, 4.5–6 mm. long; mature calyx-lobes oblong-linear, obtusish, densely strigose or abundantly short-hirsute; pedicels 1–2 mm. long; corolla white, 5–9 mm. broad; ovules 4; nutlets 1–4, apparently with the axillary one always developing, ovate-oblong, smooth and shiny, light colored, frequently somewhat mottled with brown, 2.8–3.3 mm. long, 1.2–1.5 mm. broad, apex acute and slightly outcurved, base rounded, edges acute particularly above the middle; back of nutlet flattish or low convex, occasionally above the middle somewhat obtuse with a rather definite medial ridge; inner face of nutlet right-angled with the groove closed throughout; gynobase about $\frac{2}{3}$ height of nutlets; style usually very conspicuously surpassing the nutlets, more than twice the length of the gynobase.—Anal. Univ. Chile cxxi. 822 (1908) and Fl. Chile v. 227 (1910). *Eritrichium gnaphalioides* A. DC. Prodr. x. 131 (1846); Clos in Gay, Fl. Chile iv. 466 (1849); Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 213 (1860); Ph. Cat. Pl. Itin. Tarapaca 56 (1891). *E. fruticosum* Ph. Linnaea xxix. 15 (1857).

CHILE. Coquimbo: Baños del Toro, *no collector given* (MS); Pachuana, Oct. 1878, *Philippi* (MS); rocky place, Prov. Coquimbo, Sept. 1836, *Gay 1077* (MS, type of *E. fruticosum;* G, photo.); Prov. Coquimbo, 1839, *Gay* (G, photo. of type of *E. gnaphalioides*). Atacama: Rio Laguna Grande, 2300 m. alt., Jan. 1924, *Werdermann 238* (G, US, FM, IP); Potrero de Toledo, Rio Laguna Grande, 2660 m. alt., Jan. 1926, *Johnston 5895* (G); Yerba buena near Carrizal, Sept. 1885, *King* (MS); Yerba buena, Oct. 1871, *Reed* (G); Bandurrias, 1885, *Geisse* (MS); Desert of Atacama [Bandurrias] *Geisse 24* (NY); Copiapó, June 1841, *Gay 1074* (MS); Aguada del Tabaco, Sierra San Miguel, 3000 m. alt., Nov. 1925, *Johnston 4892* (G); Quebrada San Miguel above Los Marayes, Sierra San Miguel, Nov. 1925, *Johnston 4919* (G); Quebrada de Paipote, Jan. 1885, *F. Philippi* (MS); Potrerillos, 1920, *Harding 22848* (US, NY); vicinity of Potrerillos, 2500 m. alt., Oct. 1925, *Johnston 3696* (G); Quebrada de Doña Ines Chica, Jan. 1886, *Gigoux* (G). Indefinite: no locality given, *Gay* (G, NY).

A common and very characteristic undershrub of gravelly slopes and plains between 2000 and 3000 m. alt. in the arid mountains of the Province of Atacama. Frequently the dominant perennial over large areas. The greatest abundance of the plant noted was on the barren llano near the highest point on the railroad between Copiapó

and Pueblo Hundido, where at about 2000 m. alt. the plants of this species were extremely common and apparently the only kind of vegetation over many square kilometers. The plant is well known to the natives frequenting the mountains as "Té burro," "Té del campo" or "Té blanco." An infusion of the leaves is used as a beverage. Generally, however, this *Cryptantha* is used in tea-making only when the more generally favored "Té colorado" or *Vivania rosea* is unobtainable.

2. **C. dichita** (Ph.), comb. nov. Very coarse annual, 1–3 dm. tall; stems erect or ascending, one to several, subsimple or with a few short ascending branches, short-hispid and (especially above) coarsely pungent tawny-hirsute, 2–4 mm. thick; leaves broad and coarse, obtuse, hirsute and short-hispid, at least the under surface conspicuously pustulate, the lower leaves 7–11 mm. broad and 5–7 cm. long; middle and upper cauline leaves oblong or lanceolate, 3–5 cm. long, 8–13 mm. broad; spikes coarse, dense, 1–2 cm. long, bractless or with a leafy bract at base; fruiting calyx ovate-oblong, coarse, ca. 5 mm. long, short pedicellate; fruiting calyx-lobes linear or spathulate-linear, erect, hirsute and hispid, midrib not prominent; corolla large, 7–10 mm. broad, white with a yellow throat; fruit 4-ovulate; nutlets 2, oblong-lanceolate, 3–3.3 mm. long, smooth and shiny, apex acute, back flat or low convex, sides angled, groove very narrow; gynobase $\frac{1}{2}$–$\frac{2}{3}$ height of nutlets; style very much surpassing nutlets, about twice length of gynobase.—*Eritrichium dichita* Ph. in Villanueva, Anal. Univ. Chile liii. 444 (1878), nomen; Ph. Anal. Univ. Chile xc. 516 (1895); Reiche, Anal, Univ. Chile cxxi. 831 (1908) and Fl. Chile v. 236 (1910).

CHILE. ATACAMA: "Desierto de Atacama," 1877, *Villanueva* (MS, TYPE; G, photo.); Potrerillos, 1920, *Harding 22849* (US); near Los Alamos, Quebrada de Potrerillos, 2400 m. alt., *Johnston 3695* (G).

The two collections with precise locality-data both come from about Potrerillos in the Department of Chañaral. Since Villanueva, who collected the type, mentions visiting the Quebrada Salado and such other localities in the Potrerillos region as Pedernales Lake, Doña Ines Chica, etc., it is not improbable that the type of the species actually came from that general region. According to him the plant was called "dichita" and was eaten by animals.

3. **C. hispida** (Ph.) Reiche. Annual, 1–2 dm. tall, coarsely hirsute, stiffly erect with a few short strictly ascending floriferous branches above; leaves linear, strictly ascending, 1–4 cm. long, 2–3 mm. broad, coarsely hirsute; spikes dense, bractless, ca. 1 cm. long;

fruiting calyx ovate-oblong, 4–5 mm. long, short-pedicellate; mature calyx-lobes linear, erect, commonly hirsute, midrib not very prominent; corolla 5–7 mm. broad, white; fruit 4-ovulate; nutlets 1–2, smooth and shiny, pale, oblong-lanceolate, 3–3.3 mm. long, ca. 1.4 mm. broad, apex acute, base rounded, edges angled, back flat or broadly obtuse with a weak but definite medial ridge, ventrally right-angled, groove closed to base and unforked; gynobase $\frac{1}{2}-\frac{2}{3}$ height of nutlets; style very long, much surpassing the nutlets, about twice the length of gynobase.—Anal. Univ. Chile cxxi. 831 (1908) and Fl. Chile v. 236 (1910). *Eritrichum hispidum* Fl. Atac. 38 (1860) and Viage Des. Atac. 44 and 212 (1860).

CHILE. ATACAMA: Quebrada de Doña Ines Chica, Dept. Chañaral, Jan. 1886, *Gigoux* (G). ANTOFAGASTA: Alto de Varas, Dept. Taltal, 3700 m. alt., 1854, *Philippi* (MS, TYPE; G, photo.).

After *C. phaceloides*, from which species it is scarcely separable, the closest relative of this species is *C. dichita*. It differs from that species in its very much more slender habit and smaller flowers and leaves. Although all the material I have seen falls readily and definitely into one or the other of these two species, I should not be surprised if future collecting gave reason for treating *C. dichita* and *C. hispida* as subordinate to *C. phaceloides*.

4. **C. phaceloides** (Clos) Reiche. Annual, 1.5–3 dm. tall, hirsute, stiffly erect, loosely branched; leaves linear, rather few, 1–2 cm. long, 2–3 mm. broad, ascending, hirsute and pustulate; spikes geminate or ternate, spreading, 6–12 mm. long, bractless, densely flowered; fruiting calyx ovate, ca. 4 mm. long, with a short coarse pedicel; mature calyx-lobes lanceolate to linear, erect, appressed hispid and hirsute along the weakly prominent midrib; corolla 4–5 mm. broad, white; fruit 4-ovulate; nutlets 4, slightly heteromorphous with the axial one a trifle the largest, brown and somewhat mottled, oblong-lanceolate, 3.5–3.8 mm. long, ca. 1.5 mm. broad, apex acute, base obtuse, edges acute, back low-convex, groove closed with a small areola at the acute basal forking; gynobase $\frac{2}{3}-\frac{3}{4}$ height of nutlets; style shortly surpassing the odd nutlet.—Anal. Univ. Chile cxxi. 813 (1908) and Fl. Chile v. 218 (1910). *Eritrichium phaceloides* Clos in Gay, Fl. Chile iv. 468 (1849), not tab. 52 bis! *Krynitzkia phacelioides* F. & M. acc. F. Ph. Cat. Pl. Chile 211 (1881); Gray, Proc. Am. Acad. xx. 280 (1885).

CHILE: no locality given, *Gay* (G, frag. of the TYPE).

I know this species only from the original description and from some fragments (a leaf and a spike with mature fruit and flowers),

apparently from the type, sent me through the courtesy of Professor H. Lecomte. The material is without precise locality-data. When the species was published, however, it was said to grow "en Copiapo." The region immediately about Copiapó and especially that just to the south and west has been quite well explored botanically, yet the species does not appear to have been rediscovered. It is not improbable that Gay got the specimens on his journey through the cordilleras southeast of Copiapó. The species is extremely close to *C. hispida* which grows in the cordilleras in the northern part of the Province of Atacama. The plant described above is not that illustrated by Gay. A comparison of the original description of *C. phaceloides* with the plant subsequently illustrated as that species is sufficient to demonstrate that two species are concerned. The plant illustrated as *E. phaceloides* is obviously a member of the section *Geocarya* and is apparently that which I have described as *C. Gayi*.

5. **C. albida** (HBK.) Johnston. Annual, 1–3 dm. tall; stems erect or loosely ascending, solitary or several, subsimple or paniculately branched above, very leafy, finely ashy-hispid; pubescence usually appressed below and spreading above; leaves narrowly oblanceolate or spathulate to linear, obtuse, appressed-hispid and somewhat pustulate, reduced up the stem but extending through the inflorescence as linear bracts; lower and middle cauline leaves 2–7 cm. long, 1.5–4 mm. broad; spikes solitary, numerous, loosely bracted, 1–7 cm. long, becoming remotely flowered; fruiting calyx ovate, 2–3 mm. long, subsessile, tardily deciduous; mature calyx-lobes ovate-oblong to narrowly lanceolate, acute, loosely connivent, margins appressed-hispid, midrib somewhat prominent and short-hirsute; corolla white, inconspicuous, ca. 2.5 mm. broad; fruit 4-ovulate; nutlets usually 4, homomorphous with the abaxial one subpersistent, triangular-ovate, 1–1.5 mm. long, broadly tuberculate and usually somewhat granulate, rather thick, not crowded, touching one another only close to the gynobase and hence individually separated by an obvious sinus, apex acute, base truncate or obtuse, back convex, sides straight and deep, ventrally with a large open triangular areola which appears to be excavated at maturity through the breaking away of the attachment-surface from the nutlet-walls; gynobase narrowly pyramidal, a little shorter than the nutlets; style much surpassing the nutlets.—Contr. Gray Herb. lxviii. 53 (1923); Johnston, Contr. Gray Herb. lxxiv. 42 (1925). *Myosotis albida* HBK. Nov. Gen. et Sp. iii. 91 (1818). *Lithospermum ramosum* Lehm. Asperif. ii. 328 (1818). *Eritrichium ramosum* A. DC. Prodr. x. 132 (1846). *Krynitzkia ramosa* Gray, Proc. Am. Acad. xx. 274 (1885). *C. ramosa* Greene, Pittonia i. 115

(1887). *E. hispidum* Buckley, Proc. Acad. Philad. 1861, pg. 462 (1861). *E. falcatum* Hieron. [Sertum Sanjuan.] Bol. Acad. Nac. Cient. Cordoba iv. 64 (1882). *C. falcata* Johnston, Contr. Gray Herb. lxviii. 54 (1923). *K. mexicana* Brandg. Zoe v. 182 (1904). *C. argentinica* Brand in Fedde, Repert. xx. 318 (1924).

ARGENTINA. CATAMARCA: sand, El Suncho, Dec. 26, 1916, *Jörgensen 1810* (G). LA RIOJA: Cuesta de la Puerta de Piedra, Sierra Velasco, Jan. 8–11, 1879, *Hieronymus & Niederlein 16* (G, fragment of TYPES of *E. falcatum* and *C. argentinica*). JUJUY: La Guiaca, Feb. 1916, *Hauman* (G).

I have been quite unable to separate the Argentine plant from the better known one of Mexico. The matter of leaf-breadth which Brand gives as separating them is hopelessly inadequate. The habit, flowers and the fruiting structures agree surprisingly and I doubt if there are characters that will separate the Mexican from the Argentine material.

It seems that *C. argentinica* Brand and *E. falcatum* Hieron. are clearly synonymous. The first collection cited by Brand and apparently that which he considers the type of his *C. argentinica* is *Hieronymus & Niederlein 16* from the Sierra Velasco in La Rioja. The type is in the Berlin herbarium. The specimen of this same collection in the herbarium of the University of Cordoba, Argentina, must be considered the type of *E. falcatum*, for as Dr. C. C. Hosseus, *in lit.*, has emphasized to me Hieronymus definitely stated in publishing his species that he had used the material from the Sierra Velasco in drawing up his description since the other collection (that made by Echegaray at Leoncito in San Juan), which he referred to the species, was imperfect. Brand used the name *C. falcata*, apparently for a different species, but for which one I do not know.

6. **C. diplotricha** (Ph.) Reiche. Annual, 1–1.5 dm. tall; stems several, erect, frequently somewhat decumbent at base, appressed-hispid and sparsely hirsute with short pallid hairs; leaves linear or spathulate-linear, 1–2 cm. long, 1.5–3 mm. broad, appressed short-hispid, somewhat pustulate, reduced up the stem but extending through the inflorescence as bracts; spikes solitary or rarely geminate, bracted, 1–4 cm. long, very numerous, congested; fruiting calyx ovate, ca. 2.5 mm. long, very hispid, subsessile; mature calyx-lobes lanceolate, erect or loosely connivent; corolla white, inconspicuous, tubular, ca. 0.8 mm. broad; fruit 4-ovulate; nutlets usually 4, homomorphous with apparently a slight emphasis on the abaxial one, lucid, triangular, dark with light-colored tuberculations or wrinkles, 1–1.5 mm. long, readily deciduous, crowded and closely juxtaposed with no open sinus between the individual nutlets, apex acute and slightly recurving, base trun-

cate, sides sharply margined, back usually convex; groove open or closed above but below expanded broadly into a shallow open triangular areola; gynobase subulate, about equalling length of nutlets; style clearly surpassing the nutlets.—Anal. Univ. Chile cxxi. 821 (1908) and Fl. Chile v. 226 (1910). *Eritrichium diplotrichum* Pl. Cat. Pl. Itin. Tarapaca 57 (1891). *E. diplotrichum*, var. *humilis* Ph. l. c. *C. diplotricha*, var. *humilis* Reiche, l. c. *E. axillare* Ph. l. c. *C. axillaris* Reiche, l. c. *C. modesta* Brand in Fedde, Repert. xx. 48 (1924).

ARGENTINA. Los Andes: between Antofagasta and Calalaste, 3600 m. alt., Jan. 1885, *F. Philippi* (MS, type of *E. diplotrichum;* G, photo); Breas, Jan. 1885, *F. Philippi* (MS, type of *E. diplotrichum*, var. *humilis;* G, photo.); between Breas and Salar, Jan. 1885, *F. Philippi* (MS, type of *E. axillare;* G, photo.). La Rioja: Tambillos, 1600 m. alt., *Hosseus 1711* (G, part of type of *C. modesta*).

Most related to *C. albida* but clearly different, particularly as to fruit. Both Brand and Reiche have placed the species in the section *Eucryptantha*, accrediting it with cleistogamic flowers. I have searched for closed-flowers but have been quite unable to find any. The corollas are small and tubular, however, and perhaps might be mistaken for cleistogamic ones if not examined under high magnification.

7. **C. parviflora** (Ph.) Reiche. Slender annual, 3–20 cm. tall; stems commonly one, usually loosely branched from near base, very leafy, more or less abundantly appressed chalky-hispid and frequently also somewhat spreading short-hirsute; leaves linear, 5–40(–50) mm. long, 1–2 mm. broad, appressed-hispid or spreading short-hirsute, somewhat pustulate beneath, weakly reduced up the stem and in plants beginning to fruit somewhat obscuring the spikes; spikes solitary or geminate, 1–5(–7) cm. long, numerous, bractless except for a leafy bract at base; fruiting calyx ovate or oblong-ovate, 1.5–2 mm. long, sessile, readily deciduous; mature calyx-lobes lanceolate or lance-oblong, connivent, densely short-hirsute; corolla minute, subtubular, 0.3–0.5 mm. broad, white; fruit 4-ovulate; nutlets usually 4, heteromorphous, ovate or triangular-ovate, dark with pale tuberculations or broad murications, apex acute, base rounded, back convex, edges sharply margined, groove usually closed above but below dilated into a shallow triangular areola; odd-nutlet abaxial, largest and most persistent, ca. 1 mm. long; consimilar nutlets 0.6–0.8 mm. long, readily deciduous; gynobase ca. $\frac{2}{3}$ height of odd-nutlet; style much surpassing odd nutlet, a little shorter than the gynobase.—Anal. Univ. Chile cxxi. 821 (1908) and Fl. Chile v. 226 (1910). *Eritrichum parviflorum* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 10 and 213 (1860). *E. microphyllum* Ph. Cat. Pl. Itin. Tarapaca 57 (1891). *C. micro-*

phylla Reiche, l. c. 828 and l. c. 233. *C. piscoensis* Brand in Fedde, Repert. xx. 49 (1924). *C. umbelliformis* Brand, l. c. 317. *C. Seleri* Brand, l. c. 317.

CHILE. ATACAMA: Chañarcillo, Sept. 1876, *no collector given* (MS; G, photo.); Bandurrias, *Geisse* (MS); Desert of Atacama [? *Bandurrias*], *Geisse 58B* (NY); Atacama Desert, 1884, *San Roman* (MS; G, photo.); gravel, hills north of Copiapó, 800 m. alt., *Johnston 5026* (G); Caldera, Dec. 1853, *Philippi* (MS, TYPE of *E. parviflorum;* G, photo.); coastal dunes, Caldera, *Johnston 5059* (G); gravelly bench near Caleta Pan de Azucar, *Johnston 5837* (G). ANTOFAGASTA: dry slope, Sierra Esmeralda, *Johnston 5681* (G). TARAPACÁ: Chismisia, March, 1885, *Rahmer* (MS, TYPE of *E. microphyllum;* G, photo.).

PERU. MOQUEGUA: hills southeast of Moquegua, 1500–1600 m. alt., *Weberbauer 7398A* (G, FM). AREQUIPA: open sandy and rocky slopes, Tingo, 2100–2300 m. alt., *Pennell 13112* (G, FM); open gravelly slope above Arequipa, 2500 m. alt., *Pennell 13177* (G, FM); Yura, 1884, *Borm* (G). ICA: slopes above Pisco, 1200–1300 m. alt., *Weberbauer 5375* (G, part of TYPE of *C. piscoensis*). LIMA: open rocky slope, Quive, 800–1000 m. alt., *Pennell 14300* (G); mountains near Chosica, 1500 m. alt., *Weberbauer 5337* (FM, ISOTYPE of *C. umbelliformis*).

This species, while evidently distinct, is very closely related to the North American *C. angustifolia* (Torr.) Greene and *C. Grayi* (V. & R.) Macbr., cf. Contr. Gray Herb. lxxiv. 31 and 38–40 (1925). All the material cited above has heteromorphous nutlets with the abaxial one evidently the largest and most persistent. In this fact as well as in general form and appearance of the nutlets, the present species agrees closely with *C. angustifolia,* though in size of parts and general aspect it is much nearer *C. Grayi.*

I have been quite unable to separate specifically the Chilean and Peruvian plants. In a very general way it can be said that the Peruvian specimens are somewhat more strictly branched and more leafy particularly above. These, however, are but vague differences and, perhaps, hardly more than an impression. The type and only known collection of *E. microphyllum* unquestionably belongs here. The specimen is a poor one, with numerous simple flagellate branches and linear leaves ca. 6 mm. long. In habit it very much suggests *C. pusilla* (T. & G.) Greene, of North America. The nutlets are clearly heteromorphous. I have seen no authentic material of *C. Seleri* but assume it to be the hispid plant collected by Pennell and Borm in the vicinity of Arequipa. *Cryptantha umbelliformis* I believe to be merely a young state of the same form. *Cryptantha piscoensis* has an appressed pubescence and is a somewhat coarser form. It has been collected at Quiva by Pennell.

Possibly representing a distinct species in my own collection, no. 6281, from a dryish bench just below the fertile belt in the hills back

of Mollendo, Peru. This plant definitely has homomorphous nutlets. Though the nutlets are all consimilar, the abaxial one is more firmly attached to the gynobase than are the others. In other than the homomorphy of its nutlets the plant is quite like the Peruvian forms of *C. parviflora*. It has the appressed pubescence and the slightly coarse habit of the type of *C. piscoensis*.

8. **C. subamplexicaulis** (Ph.) Reiche. Perennial or persistent annual with a firm branching root, erect and subsimple at first but later with several or many trailing branches from a loose fruticulose caudex and forming a loose prostrate mat 3–12 dm. broad and 1–2 dm. tall, hispid or hispid-villous and usually appressedly so and canescent; leaves linear to linear-lanceolate or oblong-lanceolate, 1–4 (–5) cm. long, 2–4(–5) mm. broad, acutish, sessile by a broad usually cordulate or rounded base, more or less pustulate; spikes solitary or geminate, bractless, 3–12 cm. long, becoming remotely flowered; fruiting calyx ovate or ovate-oblong, 3–5 mm. long, contracted below into a short stout and angled pedicellate base; mature calyx-lobes lanceolate or linear, erect with tips more or less spreading, densely or at times sparsely appressed hispid-villous, the midrib prominent below middle and more or less hirsute; corolla evident, 5–6 mm. broad, white; fruit 4-ovulate; nutlets 4, homomorphous or somewhat heteromorphous with the axial nutlet (always the most persistent) slightly the largest and dullest, 1.5–1.9 mm. long, tuberculate or papillate, obscurely granulate, sometimes sparsely stipitate-glandular, apex acute, base truncate or obtuse, sides angled, back convex or obscurely obtuse; groove narrow or closed, usually with a small areola at the broad basal fork; gynobase $\frac{2}{3}-\frac{3}{4}$ height of nutlets; style very much surpassing the nutlets and about twice length of gynobase.—Anal. Univ. Chile cxxi. 826 (1908) and Fl. Chile v. 231 (1910). *Eritrichum subamplexicaule* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 25 and 213 (1860).

CHILE. ANTOFAGASTA: dry shrubby hillside, Cerro Perales near Taltal, *Johnston 5633* (G); Paposo, Dec. 1853, *Philippi* (MS, TYPE; G, photo.); fertile belt on west slope of Cerro Yumbes, Paposo, *Johnston 5562* (G); slopes in fertile belt, El Rincon just north of Paposo, *Johnston 5543* (G); grassy slope in fertile belt above Aguada Panulcito, *Johnston 5475* (G); sheltered places, Aguada Panul, *Johnston 5448* (G); moist bench in quebrada, Aguada de Miguel Diaz, *Johnston 5416* (G); dune slope just southwest of Aguada de Miguel Diaz, *Johnston 5412* (G); dune slope just back of Punta Reyes below Aguada de Miguel Diaz, *Johnston 5411* (G).

A well marked species in its typical form, characterized by its very remarkable habit. The plant grows on the fog-bathed middle slopes of the hills fronting the sea. The long branches trail through the

grass or even clamber somewhat in the low bushes forming a loose mat commonly about 8 dm. broad. Although appearing to flower the first year, it seems to persist ordinarily at least for several seasons, forming a loosely branched depressed fruticulose caudex.

The three collections from the vicinity of Miguel Diaz are not typical, having longer more hirsute calyces and non-canescent herbage. The two collections from the dunes are further atypical, being more or less ascendingly branched and not certainly persistent. It is not improbable that future collecting will show the plants from Miguel Diaz to be worthy of special nomenclatorial recognition. As now known *C. subamplexicaulis* reaches its northern limit at Miguel Diaz. The species is reported from Iquique and Tocopilla by Reiche, but through misdeterminations of *C. filiformis*.

9. **C. argentea**, sp. nov. Perennis prostrata dense argenteo-strigosa; ramis numerosissimis ramosis e caudice prostrato dense ramoso fruticoso orientibus in pulvinum 2–5 cm. altum 1–4 dm. latum densum congestis; foliis firmis 5–15 mm. longis 1–2 mm. latis dense argenteo-strigosis numerosis acutis basi rotundis vel cordulatis, superioribus paullo reductis, inferioribus conspicue marcescentibus; spicis geminatis vel solitariis 3–12 cm. longis ebracteatis; calycibus fructiferis ovatis 2–3 mm. longis deciduis basem versus crasse angulatimque attenuatis; lobis calycis oblongi-linearibus obtusis strigosis vel dense velutinis, supra medium plus minusve herbaceis et saepe recurvatis vel ascendentibus, infra medium erectis cum setis flavescentibus paucis perbrevibus horridis; corolla conspicua alba 2–4 mm. lata; fructu 4-ovulato; nuculis 4 homomorphis cum nucula axillari subpersistenti 1.5–2 mm. longis tuberculatis vel papillatis minute granulatis apice acutis basi rotundatis dorso convexis ventre $\frac{2}{3}$–$\frac{3}{4}$ longitudinis ad gynobasem adfixis, sulcis clausis vel anguste apertis in areolam deltoideam dilatatis; stylo nuculam longe superante quam gynobasis duplo longori.

CHILE. ANTOFAGASTA: crevices about head of high fog-bathed sea-cliffs near Aguada Cachina, *Johnston 5734* (G); about head of high fog-bathed sea-cliffs near Aguada Grande, *Johnston 5814* (G, TYPE).

This species is known only from the crevices about the head of the high line of huge fog-bathed sea-cliffs which stretch for about 25 km. northward from the Atacama-Antofagasta provincial boundary between Caleta de Pan de Azucar and Caleta Esmeralda. The plant is notable for its silvery, very dense strigose pubescence and particularly because of its very densely pulvinate habit. The root is strong, branched and indubitably perennial. The species is evidently most related to *C. subamplexicaulis* of the fertile fog-bathed hillsides north

of Taltal, but is clearly different in its pulvinate habit, silvery pubescence, smaller corollas and inconspicuously hirsute calyces.

10. **C. chaetocalyx** (Ph.), comb. nov. Annual; stems several, 4–10 cm. long, spreading, loosely branched, with a very short mostly appressed slender hispid pubescence; leaves linear or oblong to lanceolate, obtusish, 1–1.5 cm. long, 1–3(–4) mm. broad, scabrous, short-hirsute, evidently and abundantly pustulate; spikes 1–3 cm. long, bractless, solitary or geminate, becoming loose in age; fruiting calyx ovate, 2–4 mm. long, contracted into a short stout angulate pedicellate base; mature calyx-lobes linear, above middle sparsely hirsute and green and spreading, midrib very prominent and pungent short-hirsute below middle; corolla white, 2.5–5 mm. broad; ovules 4; nutlets usually 4, homomorphous with the axial one most persistent, 1.5–2 mm. long, oblong-ovate, very finely granulate, more or less obscurely rugulose or tuberculate, apex acute, sides sharp, base rounded, back convex without a medial ridge; gynobase ca. $\frac{3}{4}$ height of nutlets; style definitely surpassing the nutlets.—*Eritrichum chaetocalyx* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 10 and 213 (1860). *E. divaricatum* Ph. Anal. Univ. Chile xc. 534 (1895). *C. divaricata* Reiche, Anal. Univ. Chile cxxi. 827 (1908) and Fl. Chile v. 232 (1910). *E. pustulosum* Ph. Anal. Univ. Chile xc. 537 (1895).

CHILE. ATACAMA: Bandurrias, *Geisse*, (MS); Desert of Atacama [? Bandurrias], *Geisse 154* (NY); Atacama Desert [Caldera region], *Morong 1235* (G, NY, US, FM); "Caldera ? Copiapó," *no collector given* (MS); Caldera, Dec. 1853, *Philippi* (MS, TYPE of *E. chaetocalyx;* G, photo.); Caldera, Sept. 1879, *no collector given* (MS, TYPE of *E. pustulosum;* G, photo.); Caldera, Sept. 1885, *F. Philippi* (MS, TYPE of *E. divaricatum;* G, photo.); Caldera, 1906, *Gigoux* (G).

Although in the original account of *E. chaetocalyx* the type is given as coming from near Pan de Azucar, lat. 26° 10′, I feel certain that in fact it came from Caldera, lat. 27° 5′. There are no specimens in the Philippi herbarium from north of Caldera. I searched for the plant about Caleta de Pan de Azucar and did not find it. In the Philippi herbarium there is but a single collection labeled *E. chaetocalyx* which was collected by Philippi during his travels in the Atacama Desert in 1853–4. This is from Caldera and checks perfectly with the original description. It is notable that in the text of the narrative of his explorations, Philippi does not mention the species in connection with Pan de Azucar although he does so with Caldera. Hence I feel confident that the locality given with the original description is an error and probably a slip of the pen. The type almost certainly came from Caldera. The species is a very distinct one with characteristic coarse spreading stems and more or less obscurely roughened nutlets. Its

relations are with *C. granulosa* and *C. filiformis* though it is quite distinct from both.

11. **C. filiformis** (Ph.) Reiche. Annual, 5–30 cm. tall, usually loosely and ascendingly branched from the base, finely hispid and frequently appressedly so; leaves not numerous, lanceolate to lance-linear or oblanceolate, 1–3 cm. long, 1–5(–9) mm. broad, obtuse or acutish, sessile, pustulate and hirsute; spikes solitary or geminate, 1–10 cm. long, bractless, becoming loosely flowered; fruiting calyces ovate or oblong-ovate, 3–5 mm. long, subsessile; mature calyx-lobes linear or lance-linear, obtusish, hirsute below the middle, above the middle usually herbaceous sparsely appressed short-hispid and spreading; corolla conspicuous, 4–7 mm. broad, white; fruit 4-ovulate; nutlets usually 4, heteromorphous, ovate or ovate-oblong, back obscurely obtuse, base truncate, sides angled, groove opened or closed and broadly forked near base; odd nutlet axial, evidently the largest, 1.5–2 mm. long, most firmly affixed, palest, tuberculate or muricate or papillate, more or less stipitate-glandular; homomorphous nutlets 1.3–1.5(–1.7) mm. long, tuberculate, brownish; gynobase about $\frac{2}{3}$ length of nutlets; style much surpassing nutlets, about twice length of gynobase.—Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichum filiforme* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 213 (1860). *E. mite* Ph. Anal. Univ. Chile xc. 539 (1895). *C. mitis* Reiche, l. c.

CHILE. ANTOFAGASTA: Hueso Parado, Taltal, 1853, *Philippi* (MS, TYPE of *E. filiforme;* G, photo.); coastal hills, Tocopilla, Sept. 1889, *Vidal* (MS, TYPE of *E. mite;* G, photo.); Tocopilla, *no collector given, no. 13* (MS); gravelly fog-bathed slope, Tocopilla, Oct. 1925, *Johnston 3578* (G). TARAPACÁ: Quebrada Huantaca, Iquique, Sept. 1904, *Martens* (MS); Quebrada Huantajaya, Iquique, 700 m. alt., Sept. 1925, *Werdermann 764* (G).

The type of *C. filiformis* is a very small slender plant given as from Hueso Parado at Taltal. Although with a different gross aspect, it has the fruit-characters, the calyx and pubescence of the Tocopilla and Iquique plants. I made very many collections of Cryptanthas in the region about Taltal but did not discover any plants there that could be mistaken for *C. filiformis*. If the plant actually came from the Taltal region it must be rare or very local. The known range of the species is very disrupted. The material at hand shows variation in size and shape of the calyx-lobes and to some extent in the outline of the nutlets also. However, these variations are unimportant since they are all present among the large suite of specimens I collected on a single hillside at Tocopilla.

12. **C. granulosa** (R. & P.) Johnston. Annual, 5–30 cm. tall; stems erect, becoming loosely and ascendingly branched, finely hispid

with the hairs appressed or somewhat spreading; leaves linear, 2–3.5 cm. long, 2–4 mm. broad (rarely, in *C. latifolia*, somewhat oblong and 5–10 mm. broad), obtuse, rounded to a sessile base, sparsely pustulose-setose; spikes solitary or geminate, bracted, 3–12 cm. long, becoming loosely flowered; bracts few to many, linear or oblong, 3–5(–10) mm. long; fruiting calyx ovate, 2–4 mm. long, subsessile; mature calyx-lobes linear or lance-linear, obtuse, sparsely appressed-hispid, below middle sparsely short-hirsute on the weakly prominent midrib, above middle more or less herbaceous and spreading; corolla evident, white, 2–4 mm. broad; ovules 4; nutlets 4, homomorphous or heteromorphous with the axial one (always subpersistent) slightly the largest, ovate-oblong, 1.3–1.8 mm. long, tuberculate or papillate and somewhat glandular, apex acute, base rounded or obtuse, edges angled, back convex, groove closed or gradually dilated towards the base; gynobase $\frac{2}{3}$–$\frac{3}{4}$ height of nutlets; style surpassing the nutlets, about equalling the gynobase.—Contr. Gray Herb. lxviii. 54 (1923). *Myosotis granulosa* R. & P. Fl. Peruv. ii. 5 (1799). *C. latifolia* Johnston, Contr. Gray Herb. lxxiii. 73 (1924).

PERU. LIMA: mountains near Chosica, 1400 m. alt., *Weberbauer 5340* (FM); Mount San Augustin near Lima, 250 m. alt., *Weberbauer 5695* (FM); loose stony upper slopes of seaside hills, Chorrillos near Lima, 150 m. alt., *Macbride 5861* (FM, TYPE of *C. latifolia;* G, ISOTYPE). AREQUIPA: sandy hills, Mollendo, *Hitchcock 22357* (US, G); lower edge of fertile belt in hills back of Mollendo, *Johnston 3532* (G).

I have concluded that *C. latifolia* is merely the luxuriant phase of *C. granulosa.* Mounted on the sheet with the type is a small plant, which is apparently typical of Ruiz & Pavon's species. The plant from Mollendo seems to belong to the present species, but appears to be very much more abundantly bracted than is the typical form about Lima.

13. **C. taltalensis**, sp. nov. Annua 1–3 dm. alta laxe l asaliter ramosa; ramis saepe gracilibus minute strigosis et plus minusve breviter hispidis; foliis linearibus vel rariter anguste lanceolatis paucis 1–2 cm. longis 1–2(–3) mm. latis pustulatis breviter hispidis, superioribus paullo reductis; spicis solitariis vel geminatis 3–5 cm. longis bracteatis; bracteis linearibus caducis 3–5 mm. longis; calycibus fructiferis congestis ascendentibus oblongis 3–4.5 mm. longis asymmetricis sessilibus faciliter deciduis basi conicis; lobis calycis linearibus erectis ascendenter hispidis cum costa prominenti; corolla evidenti 3–4 mm. lata alba; fructu 4-ovulato; nuculis 1–3 saepissime plures abortis heteromorphis ovatis apice acutis dorsi convexis margine angulatis, sulcis clausis vel anguste apertis basi in areolam deltoideam dilatatis; nucula axillari ca. 1.8 mm. longa subpersistenti semper maturanti

papillata plus minusve glandulari opaca ventre $\frac{3}{4}$ longitudinis ad gynobasem affixa; nuculis consimilibus tuberculatis deciduis ca. 1.5 mm. longis; stylo nuculam axillarem brevissime vel breviter superanti.

CHILE. ANTOFAGASTA: gravelly slopes near crest of hills southeast of Taltal, *Johnston 5121* (G, TYPE); rocky bottom of dry quebrada in hills southeast of Taltal, *Johnston 5120* (G); rocky talus-slope in Quebrada de San Ramon, near Taltal, *Johnston 5156* (G); dryish gravelly open places on summit ridge of Cerro Perales near Taltal, 1000 m. alt., *Johnston 5634* and *5635* (G).

This species is most closely related to *C. filaginea*, from which it differs in its larger corollas and few, strongly heteromorphous nutlets. It was found at various points in the region about the port of Taltal, always associated with *C. filaginea*, though less common and less generally distributed than that widely ranging species. Although it appeared to be a very definite and recognizable entity in the field, subsequent study of the collected material shows it so closely related to *C. filaginea* that I have been tempted to propose it merely as a variety of that species.

14. **C. Romanii**, sp. nov. Annua laxe ramosa 8–15 cm. alta sparse strigosa hirsuta; foliis linearibus 1–3 cm. longis 1–2.5 mm. latis pustulatis breviter hirsutis acutis, superioribus paullo reductis; spicis solitariis vel geminatis 2–3 cm. longis bracteatis; bracteis linearibus 4–6 mm. longis; calycibus fructiferis congestis ascendentibus oblongis 3–4.5 mm. longis asymmetricis subsessilibus deciduis basi conicis; lobis calycis linearibus erectis costatis ascendenter hirsutis; corolla conspicua 5–6 mm. lata alba; fructu 4-ovulato; nuculis 4 homomorphis cum nucula axillari subpersistenti 2 mm. longis oblongo-ovatis tuberculatis obscure granulatis apice acutis dorse convexis margine angulatis et incrassatis ventre $\frac{4}{5}$ longitudinis ad gynobasem affixis; sulcis clausis vel anguste apertis basem versus breviter furcatis; stylo nuculas valde superanti.

CHILE. ANTOFAGASTA: Sierra Esmeralda, Dept. Taltal, 1884, *San Roman* (MS, TYPE; G, photo. and frag.).

In gross habit this species much suggests *C. hispida* and in fact was so determined by Philippi. Its relations, however, are with *C. filaginea* and *C. taltalensis*, particularly the latter. It differs from both in its very large corollas. From *C. taltalensis* it also differs in its 4 homomorphous nutlets. It differs from *C. filaginea*, which I collected in the Sierra Esmeralda, in its slightly coarser habit, very large corollas and slightly larger nutlets.

15. **C. filaginea** (Ph.) Reiche. Annual, 1–2 dm. tall, erect and shortly branched above or loosely branched from the base; stems

slender, finely strigose and hispid; leaves linear or lanceolate, 1–2.5 (–3) cm. long, 1–2 mm. broad, spreading, obtuse, pustulate, finely short-hispid, weakly reduced up the stem; spikes solitary or geminate 2–5(–8) cm. long, bracteate; bracts linear, 3–6 mm. long, caducous; fruiting calyx oblong, 3–4 mm. long, usually congested, readily deciduous, sessile, ascending; mature calyx-lobes linear, below the middle appressed short hispid and along the prominent midrib hirsute, above somewhat herbaceous and sparsely hairy and slightly spreading; corolla inconspicuous, white, subtubular or with a very narrow limb, 0.5–1.5(–2) mm. broad; fruit 4-ovulate; nutlets 4 or rarely fewer, subhomomorphous with the axial one slightly emphasized and most persistent, tuberculate, usually obscurely granulate, 1.2–1.5(–1.8) mm. long, ovate or oblong-ovate, apex acute, edges angled and frequently margined, base obtuse, back convex; groove narrow or closed, forked at base; gynobase $\frac{2}{3}$–$\frac{3}{4}$ as high as the nutlets; style much surpassing the nutlets.—Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichium filagineum* Ph. Anal. Univ. Chile xc. 536 (1895).

CHILE. ATACAMA: Monte amargo, Sept. 1885, *F. Philippi* (MS, TYPE; G. photo.); Desert of Atacama [Caldera Region], *Morong 1238* (G, NY, US, FM), *1263* (G, NY, US), *1249* (NY); sand, Caldera, *Johnston 5064* (G); Caldera, 1922, *Gigoux* (G); gravelly benches and slopes, Chañaral, *Johnston 4808* (G); vicinity of Caleta Pan de Azucar, *Johnston 5831* and *5844* (G); quebrada below Aguada Grande, *Johnston 5812* (G). ANTOFAGASTA: crest of high fog-bathed sea-cliffs near Aguada Grande, *Johnston 5813* (G); wash on plain between Ag. Grande and Ag. Cachina, *Johnston 5745* (G); Cerro de la Cachina on dry gravelly crest, *Johnston 5744* (G); sandy soil, Aguada Cachina, *Johnston 5736* (G); north of Portezuelo de Mina Carola, Sierra Esmeralda, *Johnston 5682* (G); gravel, Quebrada de Taltal, *Johnston 5123* (G); gravelly slopes near crests of hills southeast of Taltal, *Johnston 5122* (G); Taltal, 100 m. alt., *Werdermann 809* (G); summit ridge of Cerro Perales near Taltal, *Johnston 5636* (G); gravelly floor of Quebrada San Ramon near Taltal, *Johnston 5157* and *5158* (G); Paso Malo north of Taltal, *Johnston 5179* (G); gravelly bench, Estancia Vieja, *Johnston 5204* (G); summit of Cerro Yumbes, Paposo, *Johnston 5547* (G); Posada, Quebrada Guanillo, Paposo, *Johnston 5601* (G); El Rincon, Paposo, *Johnston 6285* and *5546* (G); hillside, Aguada Panulcito, *Johnston 5479* (G); between Ag. Panul and Ag. Panulcito, *Johnston 5244* (G); rocky slope, Aguada Cardon, *Johnston 5295* (G); Aguada de Miguel Diaz, *Johnston 5417* and *5418* (G); quebrada just north of Antofagasta, *Johnston 3659* (G).

PERU. AREQUIPA: lower part of fertile belt in hills back of Mollendo, *Johnston 6280* (G); hills, Mollendo, *Hitchcock 22384* (G, US).

In the Museo Nacional at Santiago the original collection of this species is represented by six plants, two in the small herbarium of Federico Philippi and four in the main herbarium of the museum. It seems certain that the older Philippi described his species from the latter four plants. These are associated with a label giving the

locality as "Monte amargo," a station on the railroad about half-way between Caldera and Copiapó. This collection of four plants is a mixture, three representing *C. filaginea* as here defined and one being a plant of *C. parviflora* just coming into fruit. I suspect that the plant of *C. parviflora* is the one mentioned by Philippi as having been collected by Borchers near Caldera. It seems very probable, also, that the specific name, *filaginea*, was suggested by this same odd plant.

The species seems to reach its southern limit in the Caldera-Copiapó region. It is very generally distributed in the coastal region further north, in fact is the predominating and common species of the genus in the coastal portion of the Department of Taltal. It is related on one hand to *C. taltalensis* and on the other to *C. limensis*. The latter is a coarser plant and less branched and has broader firmer leaves and larger fruiting calyces.

16. **C. limensis** (A. DC.) Johnston. Annual, 5–15 cm. tall; stems usually loosely branched from the base, finely appressed-hispid; leaves oblanceolate to linear, 1–3 cm. long, 2–4 mm. broad, obtusish, finely appressed-hispid, more or less pustulate; spikes solitary or geminate, evidently bracted, 3–5 cm. long; fruiting calyx 5–6 mm. long, ovate-oblong, subsessile; mature calyx-lobes linear to linear-oblanceolate, below the middle with a prominent very hirsute midrib, above broadened herbaceous spreading and merely appressed-hispid; corolla inconspicuous, subtubular, white, ca. 1 mm. broad; fruit 4-ovulate; nutlets 4, homomorphous or sometimes slightly heteromorphous, ovate-oblong, 1.5–1.7 mm. long, tuberculate, apex acute, base truncate, back convex, edges angled, groove closed or narrow but below gradually dilated into a suprabasal triangular areola, axial nutlet always most firmly affixed and occasionally a trifle the largest; gynobase about $\frac{3}{5}$ height of nutlet; style surpassing the nutlets.—Contr. Gray Herb. lxx. 46 (1924). *Eritrichium limense* A. DC. Prodr. x. 133 (1846). *C. Macbridei* Johnston, Contr. Gray Herb. lxxiii. 74 (1924). *C. Woitschachii* Brand in Fedde, Repert. xx. 317 (1924).

PERU. LIMA: loose stony upper slopes of sea-side hills, Chorrillos near Lima, ca. 150 m. alt., *Macbride 5869* (FM, TYPE of *C. Macbridei;* G, ISOTYPE); Lima, 1833, *Abadia* (G, photo. of TYPE of *E. limense*). AREQUIPA: open places in and just below fertile belt in hills back of Mollendo, *Johnston 3531* (G). INDEFINITE: "Peru," *Woitschach* (G, fragment of TYPE of *C. Woitschachii*).

Very closely related to *C. filaginea* but a coarser plant with larger fruiting calyces. *Cryptantha Macbridei* and *C. Woitschachii* are clearly synonyms of this species.

17. **C. calycina** (Ph.) Reiche. Annual, 1–3.5 dm. tall; stems commonly solitary with short ascending laterals above or with nu-

merous long erect branches from towards the base, shaggy coarse-hirsute; leaves linear or lance-linear, 1–4 cm. long, 1.5–3 mm. broad, obtusish, hispid, somewhat pustulate; spikes geminate or ternate, bractless, glomerate or elongating and becoming very loosely flowered, 1.5–6(–10) cm. long; fruiting calyx strongly accrescent, 8–11 mm. long, 2–2.5 mm. broad, short-pedicellate; mature calyx-lobes lance-linear or linear, proximate and erect above the fruit which they greatly surpass, midrib thick and very prominent and armed with coarse slightly tawny hirsute bristles, margins villous-hispid; corolla inconspicuous, subtubular, white, 1–2 mm. broad, lobes erect; fruit 4-ovulate; nutlets usually 4, homomorphous with the axial one slightly the most persistent, lanceolate, 2.8–3.2 mm. long, 0.9–1.2 mm. broad, smooth or obscurely tuberculate particularly towards the apex, apex acuminate, back flat or broadly obtuse with, at most, an obscure low medial ridge, groove closed or very narrow but usually open at the broad forking; gynobase subulate, ca. $\frac{3}{5}$ height of nutlets; style equalling the nutlets or shortly surpassing them.—Anal. Univ. Chile. cxxi. 825 (1908) and Fl. Chile v. 230 (1910). *Eritrichum calycinum* Ph. Fl. Atac. 38 (1860) and Viage Des. Atac. 80 and 212 (1860).

CHILE. ATACAMA: talus, Rio Sancarron below Rucas, 3200 m. alt., *Johnston 6225* (G); dry rocky floor of quebrada, Rio de Valeriano above Juntas del Encierro, 3250 m. alt., *Johnston 6025* (G); Quebrada Alfalfa, 3200 m. alt., *Johnston 6004* (G); rocky hillside, Laguna Chica, 3200 m. alt., *Johnston 5961* (G); gravelly bench in quebrada east of Laguna Grande, 3400 m. alt., *Johnston 5923* (G); sunny gravelly slope, Quebrada Tolar, Sierra San Miguel, 3400 m. alt., *Johnston 4950* (G); Encantada, Jan. 1901, *Reiche* (MS). ANTOFAGASTA: Sandon, 2700 m. alt., Feb. 1854, *Philippi* (MS, TYPE; G, photo.).

An extremely well marked and very distinct species, which appears to be without any close, obvious relatives. The unusually large fruiting calyces and its very elongate nutlets make it readily recognizable. I found it usually associated with *C. diffusa*, commonly in the upper parts of the range of that species, though always much less common.

18. **C. patagonica** (Speg.) Johnston. Annual, 1–1.5(–3) dm. tall, drying dark; stems slender, erect or decumbent, usually several, commonly with short spreading branches, finely strigose or appressed short-hispid; leaves linear, obtuse, 1–3.5 cm. long, 1–2(–3) mm. broad, spreading, finely short appressed-hispid, finely pustulate beneath; spikes solitary or geminate, bractless, 1–3 cm. long, glomerate or elongating but not particularly loose-flowered; fruiting calyx ovate, 2–3 mm. long, 1.5–3 mm. broad, short-pedicellate; mature calyx-lobes narrowly lanceolate, connivent above, shortly surpassing the nutlets,

midrib prominent and hirsute, margin appressed villous-hispid; corolla inconspicuous, white, ca. 1.5 mm. broad; fruit 4-ovulate; nutlets 4, homomorphous with the axial one most persistent, lance-ovate, ca. 2 mm. long, ca. 0.8 mm. broad, smooth or more often obscurely tuberculate particularly above the middle, apex acute, base truncate, sides angled, back usually convex below the middle and flat above; groove closed or very narrow, usually with a small areola at the fork; gynobase subulate, $\frac{2}{3}$–$\frac{4}{5}$ height of nutlets; style equalling or shortly surpassing the nutlets.—Contr. Gray Herb. lxviii. 54 (1923). *Amsinckia patagonica* Speg. Anal. Soc. Cient. Argentina liii. 137 (1902).

ARGENTINA. Santa Cruz: very arid desert between Rio Santa Cruz and Rio Gallego, Feb. 26, 1882, *Spegazzini* (G); arid plains along Rio Santa Cruz, Feb. 7, 1882, *Spegazzini* (G, part of type); desert along Rio Chico, Feb. 21, 1882, *Spegazzini* (G); Patagonia, lat. 50°–53°, 1882, *Moreno & Tonini* (NY).

This species, which sets the southern limit of the genus at about lat. 52° S., is probaly most related to the very distinct *C. calycina* of the desert Andes of northern Chile. It has been much misunderstood and has passed under many names. The collection by Moreno & Tonini, above cited, is that reported as *Cynoglossospermum humile* by Kuntże, Rev. Gen. iii. pt. 2, 204 (1898). Spegazzini, Pl. Patag. Aust. 551–552 (1897), and Macloskie, Fl. Patag. 678–679 (1905), treated it as *E. diffusum* and *E. parvulum*.

19. **C. peruviana** Johnston. Annual, slender, 1–2 dm. tall; stem simple or with several long ascending branches, finely short-hispid and frequently appressedly so; leaves narrowly linear, 1–3(–6) cm. long, 1–2 mm. broad, numerous, finely hispid, inconspicuously pustulate, little reduced up the stem; spikes solitary or geminate, 1–5 cm. long, bractless, glomerate then elongating; fruiting calyx ovate, 2.5–3 mm. long, subsessile; mature calyx-lobes lance-linear or narrowly lanceolate, erect, appressed hispid-villous, somewhat hirsute along the weakly prominent midrib; corolla white, inconspicuous, subtubular with a very narrow limb 0.8–1.4 mm. broad; fruit 4-ovulate; nutlets 4 or rarely fewer, homomorphous with the axial one subpersistent and always developing, 1.5–1.8 mm. long, lance-ovate, very coarsely muricate or muricate-rugose, finely granulate, pale, apex acute, edges acute, back convex, groove closed or gradually dilated towards the base; gynobase about $\frac{3}{5}$ length of nutlets; style just surpassing the nutlets.—Contr. Gray Herb. lxxiii. 74 (1924). *C. Weberbaueri* Brand in Fedde, Repert. xx. 318 (1924). *C. cajabambensis* Brand, l. c. 319.

PERU. Ancash: Hacienda Cajabamba between Samanco and Caraz, *Weberbauer 3041* (G, frag. of type of *C. cajabambensis*); rocky places, Ocros,

3200–3400 m. alt., *Weberbauer 2658* (G, frag. of TYPE of *C. Weberbaueri*). LIMA: loose rocks on dry slope above river, Rio Blanco, 3600 m. alt., *Macbride & Featherstone 674* (FM, TYPE of *C. peruviana;* G, ISOTYPE). AREQUIPA: gravelly soil along stream-courses, Arequipa near base of El Misti, 3000–3200 m. alt., *Pennell 13235* (G, FM); ravines and hillsides on southern slopes of El Chachani north of Arequipa, 3350 m. alt., *Hinkley 77* (G, US). MOQUEGUA: open mixed formation, Torata, 2200–2300 m. alt., *Weberbauer 7398* (G, FM).

A Peruvian plant which is very closely related to *C. globulifera* and perhaps is only a phase of it differing in its northern range, slender habit and slightly smaller flower-parts. It sets the northern limit for the distribution of *Cryptantha* in South America, in the Department of Ancash occurring north almost to lat. 9° S.

20. **C. globulifera** (Clos) Reiche. Annual, 1–3(–4) dm. tall; stems few or solitary, usually loosely branched, hispidulous; leaves linear, 1–4 cm. long, 1–2 mm. broad, obtusish, short appressed-hispid, little reduced up the stem; spikes solitary or geminate, bractless, 1–6(–10) cm. long, becoming loosely flowered in age; fruiting calyx ovate-oblong, 3–4 mm. long, ascending, base rounded and very shortly pedicellate; mature calyx-lobes linear or lance-linear, connivent above with the tips somewhat spreading, margins villous, hirsute along the prominent midrib, the hairs all clean and white or only slightly tawny; corolla inconspicuous, white, subtubular, ca. 1 mm. broad; fruit 4-ovulate; nutlets 1–4, homomorphous, ovate-oblong, 1.5–2 mm. long, finely granulate, pale, weakly but densely tuberculate with the tuberculations in more or less broken transverse rows, apex acute, back convex, edges acute below middle and rounded above, groove narrowed or closed but usually with an open fork; gynobase $\frac{3}{4}$–$\frac{4}{5}$ height of nutlets; style just surpassing or a little surpassed by the nutlets. —Anal. Univ. Chile cxxi. 827 (1908) and Fl. Chile v. 232 (1910). *Eritrichium globuliferum* Clos in Gay, Fl. Chile iv. 464 (1849). *E. glareosum* Ph. Linnaea xxxiii. 189 (1864). *C. glareosa* Greene, Pittonia i. 111 (1887); Reiche, l. c. 820 and l. c. 225. *E. carrizalense* Ph. Anal. Univ. Chile xc. 526 (1895). *C. carrizalensis* Reiche, l. c. 819 and l. c. 224. *E. floribundum* Ph. Anal. Univ. Chile xc. 532 (1895). *C. floribunda* Reiche, l. c. 825 and l. c. 230. *E. parvulum* Ph. Anal. Univ. Chile xc. 535 (1895). *E. oliganthum* Ph. Anal. Univ. Chile xc. 535 (1895). *C. oligantha* Reiche, l. c. 819 and l. c. 224. *E. sphaerophorum* Ph. Anal. Univ. Chile xc. 539 (1895). *E. longisetum* Ph. Linnaea xxxiii. 189 (1864) in part; only as to plant from San Felipe which became type of *E. floribundum*, cf. Anal. Univ. Chile xc. 538 (1895).

ARGENTINA. CHABUT: gravelly places along Rio Carren-leofú, March 5, 1900, *Spegazzini* (G). RIO NEGRO: vicinity of General Roca, 250–360 m.

alt., *Fischer 131* (G, US, FM). MENDOZA: vicinity of Mendoza, Nov. 1913, *Hauman 260* (G).

CHILE. SANTIAGO: Las Arañas, Sept. 1861, *no collector given* (MS). ACONCAGUA: San Felipe, Sept. 1861, *Philippi* (MS, TYPE of *E. floribundum;* G, photo.); bed of Rio Aconcagua near San Felipe, Sept. 1860, *Philippi* (MS, TYPE of *E. glareosum;* G, photo.); San Felipe, Aug. 20, 1921, *Claude-Joseph 1408* (US); Rio Blanco, Aug. 25, 1921, *Claude-Joseph 1346* (US). COQUIMBO: common on coastal dunes, La Serena, Sept. 1836, *Gay 47* (G, frag. and photo. of TYPE of *E. globuliferum*); gravelly talus, Los Llanos, Estero de Guanta, ca. 1400 m. alt., *Johnston 6246* and *6247* (G); Paihuano, Sept. 1878, *no collector given* (MS). ATACAMA: Bandurrias, *Geisse* (MS); Desert of Atacama [? Bandurrias], *Geisse 58a* (NY); Chañarcillo, Sept. 1885, *no collector given* (MS; G, photo.); Yerba Buena, 1885, *Godoi de Collao* (MS, TYPE of *E. carrizalense;* G, photo.); Caldera, Sept. 1885, *no collector given* (MS, TYPE of *E. parvulum;* G, photo.); Caldera, Sept. 1879, *no collector given* (MS, TYPE of *E. sphaerophorum;* G, photo.); between Caldera and Copiapó?, *no collector given* (MS, TYPE of *E. oliganthum;* G. photo.); Piedra colgada, Sept. 1885, *no collector given* (MS; G, photo.); Vizcachitas, Oct. 14, 1914, *Rose 19336* (US, NY).

A somewhat variable but a natural and readily recognized species. It is not improbable that with the accumulation of study-material the species as here defined may be broken up into several minor species of restricted distribution. The material from Coquimbo is more tawny, coarser and more spreading than other forms. As here interpreted the species is notable since it is the only member of its genus generally ranging at low altitudes which occurs both in Argentina and Chile. Possibly the axial nutlet is slightly emphasized. However, in a number of cases, I found it aborted and the abaxial one developing.

21. **C. diffusa** (Ph.), comb. nov. Annual, 8–20 cm. tall; stems commonly several to many, ascending, strictly branched, hispid; leaves linear or lance-linear, 1–3.5 cm. long, 1–2.5 mm. broad, obtuse, numerous, weakly reduced up the stem, finely appressed-hispid, very obscurely if at all pustulate; spikes solitary or geminate, bractless, 1–5(–8) cm. long, glomerate but in age becoming rather loosely flowered, tawny; fruiting calyx ovate or oblong-ovate, 3–4 mm. long, ascending, base rounded and very shortly pedicellate; mature calyx-lobes lanceolate to linear-lanceolate, connivent above, at times with tips spreading, margins villous, the prominent midrib hirsute, the hairs usually very conspicuously tawny; corolla inconspicuous, sub-tubular, white, ca. 1 mm. broad; fruit 4-ovulate; nutlets 1–4, homomorphous, ovate-oblong, 1.5–2.2 mm. long, pale, finely granulate, obscurely tuberculate, marked by 6–12 more or less sinuous deep lineate transverse grooves and hence broadly wrinkled, apex acute, back flattish or obscurely obtuse or convex, edges angled, groove narrow or closed; gynobase $\frac{3}{4}$–$\frac{4}{5}$ height of nutlets; style just surpassed by or just surpassing the nutlets.—*Eritrichum diffusum* Ph.

Linnaea xxxiii. 191 (1864) and Anal. Univ. Chile xc. 523 (1895). *E. difusum* Ph. in Villanueva, Anal. Univ. Chile liii. 444 (1878), nomen. *E. micranthum* Ph. Fl. Atac. 38 (1860) and Viage Des. Atac. 80 and 212 (1860); not *E. micranthum* Torr. (1854) nor *C. micrantha* Johnston (1925). *E. Borchersii* Ph. Anal. Univ. Chile xc. 531 (1895). *C. Borchersii* Hauman, Anal. Soc. Cient. Argentina lxxxvi. 302 (1918). *E. globuliferum*, var. Ph. Anal. Univ. Chile xc. 524 (1895). (?) *C. famatinae* Brand in Fedde, Repert. xx. 318 (1924).

ARGENTINA. MENDOZA: Baños del Inca, Jan. 15, 1886, *Borchers* (MS, TYPE of *E. Borchersii;* G, photo.); Rio Tupungato, 2300 m. alt., *Hauman 271* (G); Mendoza, Jan.–Feb., *Goldsack* (MS).

CHILE. COQUIMBO: Cordilleras de Illapel, 2500 m. alt., Jan. 1906, *Reiche* (MS); in andiis Hurtado, Feb. 1837, *Gay 1622* (MS, badly diseased); "Huanta, Baños del Toro, etc.," 1860–61, *Volckmann* (MS, TYPE of *E. diffusum*; G, photo.); Doña Ana, *Peralto* (MS); Baños del Toro, 3500 m. alt., *Werdermann 220* (G, FM); Cordilleras de Coquimbo, Jan. 1904, *Reiche* (MS). ATACAMA: rocky burnt-over place, Rio Sancarron below Rucas, 3200 m. alt., *Johnston 6224* (G); loose earth in quebrada, Laguna Grande, 3450 m. alt., *Johnston 5924* (G); Quebrada de Serna, 1885, *San Roman* (MS); gravelly slope below Portezuelo Tolar, Sierra San Miguel, 3800 m. alt., *Johnston 4949* (G); stony benches, Quebrada Tolar, Sierra San Miguel, 3500 m. alt., *Johnston 4951* (G); upper part of Quebrada San Miguel, 2500–2800 m. alt., *Johnston 4932* and *4933* (G); near Los Marayes, Sierra San Miguel, 1100–1500 m. alt., *Johnston 4918* and *6282* (G); rocky draw, Potrerillos, 2800 m. alt., *Johnston 4728* (G); abandoned field, Los Alamos, Quebrada de Potrerillos, 2400 m. alt., *Johnston 3697* (G); Agua de Acerillo, Oct. 1877, *Villanueva* (MS). ANTOFAGASTA: Sandon, 2700 m. alt., Feb. 1854, *Philippi* (MS, TYPE of *E. micranthum;* G, photo).

Clearly related to *C. globulifera* but differing in its lineately transverse-grooved nutlets, usually conspicuously tawny spikes and high montane distribution. Though there is some intergradation between the two species it is rare. Commonly they are distinguished at a mere glance. In *C. diffusa* no particular nutlet seems to be emphasized nor always developing.

22. **C. debilis** (Ph.) Reiche. A weak slender annual, 1–1.5 dm. tall, with a few very loose well developed branches, sparsely hispidulous; leaves linear or oblanceolate, spreading, distant, 2–3 cm. long, 2–4 mm. broad, quite herbaceous, sparsely hispidulous, obtuse, upper ones scarcely if at all reduced; spikes geminate or solitary, spreading, 2–3 cm. long, bractless, becoming very loosely flowered; fruiting calyx broadly ovate, 2–2.5 mm. long, 1.5–2 mm. broad, base broad and very shortly pedicellate; mature calyx-lobes lanceolate, herbaceous, sparsely appressed-villous, weakly hirsute along the non-prominent midrib; corolla inconspicuous, white, subtubular, ca. 1 mm. broad, fruit 4-ovulate; nutlets 4, homomorphous, ovate-oblong, 1.5–1.8 mm. long, pale, very finely granulate, tuberculate or becoming

papillate towards apex, marked by 6–12 deep more or less sinuous lineate grooves and hence broadly transverse-wrinkled, apex acute, back convex, edges acute, groove closed or narrow; gynobase reaching to about $\frac{4}{5}$ height of nutlets; style just surpassed by nutlets.—Anal. Univ. Chile cxxi. 830 (1908) and Fl. Chile v. 235 (1910). *Eritrichium debile* Ph. Cat. Pl. Itin. Tarapaca 57 (1891).

BOLIVIA. Potosi: Paroma, ca. 3800 m. alt., Feb. 25, 1885, *F. Philippi* (MS, type; G, photo.); Chiguana, 3700 m. alt., March 22, 1921, *Asplund 5898* (US).

Obviously a close relative of *C. diffusa* and perhaps only an extreme form of it. The two collections cited agree uncommonly well in gross aspect and technical characters. They come from about 450 km. north of the northernmost known station of *C. diffusa* and differ from that species in the weak widely branched habit and smaller broader non-tawny fruiting calyces. No particular nutlet seems to be emphasized in this species.

II. Section Eucryptantha.—This section seems to be a very natural one. It is apparently derived from the section *Krynitzkia* and in turn seems to have given rise to the section *Geocarya*. With the exception of *C. glomerulifera* and *C. capituliflora*, two high Andean species that extend into western Argentina, it is restricted to Chile. It is characterized by the presence of very numerous simple cleistogamic flowers. These are specialized only in having closed corollas. At maturity the fruiting calyx is quite similar to that characteristic of the chasmogamic flowers of the particular species. Frequently these cleistogamic flowers are slightly smaller than the chasmogamic ones. They appear to be invariably biovulate whereas the chasmogamic flowers, commonly biovulate, are sporadically 4-ovulate. They are always developed in the leaf-axils along the middle and upper parts of the stem, and frequently also down to the lowermost pair of leaves and even into the spikes where they sometimes develop to the exclusion of all chasmogamic flowers. In the leaf-axils, while occasionally solitary, they commonly form small few-flowered glomerules. Occasionally these glomerules elongate but then are readily distinguished from the true spikes by their laxness and abundant bracting. The chief classificatory difficulty in this section is associated with the species, *C. glomerata*. Here the relative abundance of the cleistogamic and chasmogamic flowers varies enormously and makes profound changes in the general aspect.

Key to Species.

Plant definitely perennial.
  Fruiting calyx small, 2–2.5 mm. long; nutlets ca. 2 mm. long.
    Glomeruliferae. . . . . 23. *C. glomerulifera*.

Fruiting calyx large and coarse, 4–6 mm. long; nutlets 2–3 mm. long. *Capituliflorae.*
Plant low, with short prostrate or widely spreading densely appressed white villous-hispid stems; mature inflorescence more or less capitate.....24. *C. capituliflora.*
Plant erect or ascending, loosely branched; stems appressed-hispid; inflorescence becoming loose and open.
Plant canescent, abundantly appressed short-hispid on stems and leaves; style very much surpassing the nutlets.....25. *C. longifolia.*
Plant green, very sparsely hirsute, evidently pustulate; style equalling or shortly surpassing the nutlets. 26. *C. spathulata.*

Plant definitely annual.
Fruiting calyces armed with stiff hairs, hispid or hirsute. *Glomeratae.*
Nutlets 1.3–2 mm. long; plant green; common, widely dispersed species.....27. *C. glomerata.*
Nutlets 2.5–3 mm. long; plant canescent; rare local species. 28. *C. alfalfalis.*
Fruiting calyces long-villous, lacking stiff hairs. *Haplostachyae.*
Plant slender; cauline leaves 1–1.7 cm. long, 2–3 mm. wide; nutlets verrucose.....29. *C. haplostachya.*
Plant coarse; cauline leaves 1–2 cm. long, 5–10 mm. wide; nutlets tuberculate.....30. *C. calycotricha.*

23. **C. glomerulifera** (Ph.), comb. nov. Perennial, 3–5 dm. tall; stems tufted, erect or strictly ascending, subsimple or producing slender ascending branches above the middle, more or less abundantly appressed short-hispid; leaves very scabrous, short-hispid, pustulate at least beneath; the lower oblanceolate, crowded, acutish, 3–7 cm. long, 3–5 mm. broad, contracted to a petiole; the middle cauline linear to oblance-linear or lance-oblong, obtusish, broad at the sessile base, ca. 1–3 cm. long, 3–4 mm. broad; cleistogamic flowers solitary or glomerate in the leaf-axils all along the stem, the fruiting structures similar to those of the chasmogamic flowers; chasmogamic flowers with corolla 1.5–2 mm. broad, small, white; spikes geminate, bractless, densely flowered, ca. 1 cm. long; fruiting calyx ovate, 2–2.5 mm. long, sessile; mature calyx-lobes lance-linear to lance-oblong, short-hispid, midrib not greatly thickened; ovules 2; nutlets 2, ovate or oblong-ovate, ca. 2 mm. long, granulate, often sparsely tuberculate especially below the middle, apex acute, base truncate or obtuse, back convex or more commonly obtuse with a medial ridge, groove narrow, axial nutlet always present, abaxial one twisted around beside the axial; style equalling or surpassing nutlets, about length of gynobase; gynobase ca. $\frac{2}{3}$ height of nutlets.—*Eritrichium glomeruliferum* Ph. Anal. Univ. Chile xc. 521 (1895).

CHILE. Aconcagua: Juncal, 2400 m. alt., Feb. 25, 1903, *Buchtien 144* (G, US, MS). Coquimbo: Las Mollacas, Cordillera de Illapel, Jan. 1888, *no*

collector given (MS, TYPE; G, photo.). INDEFINITE: Cordilleras, *Cumings 236* (G).

ARGENTINA. SAN JUAN: talus in gorge above Baños San Crispin, 3500 m. alt., Jan. 1926, *Johnston 6106* (G).

A very distinct species readily distinguished from other perennial species by the small size of its flowering parts.

24. **C. capituliflora** (Clos) Reiche. Perennial, much depressed; stems few or numerous, decumbent to prostrate, 5–15 cm. long, densely and canescently villous-hispid; leaves oblanceolate, obtuse, thickish, weakly reduced up the stem, densely appressed villous-hispid, abundantly and minutely pustulate beneath; lower leaves rather crowded, 3–5 cm. long, 2–4 mm. broad; cleistogamic flowers in leaf-axils, solitary or glomerate, not numerous; chasmogamic flowers in bractless congested geminate racemes, ca. 1 cm. long, crowded into dense capitate thyrsoid terminal clusters 1–2 cm. thick; fruiting calyx oblong, 4.5–6 mm. long, short-pedicellate; mature calyx-lobes oblong to linear, obtuse, erect, velvety with a very dense villous-hispid pubescence, midrib not prominent; corolla not conspicuous, 1.5–2 mm. broad, subtubular, white drying brown; ovules usually 2 but occasionally 3 or even 4; nutlets 1–2(–4), when 2 with the abaxial one bent around beside the axial one, 2.5–3 mm. long, ca. 1.3–1.5 mm. broad, triangular-ovate, light-colored, granulate, with scattered muri-cations, apex acute, base rounded, back obtuse with a definite medial ridge, sides angles, inner face right-angled bearing an open or closed groove; gynobase ca. $\frac{2}{3}$ height of nutlets; style surpassing the nutlets. —Anal. Univ. Chile cxxi. 822 (1908) and Fl. Chile v. 227 (1910); Hauman, Anal. Soc. Cient. Argentina lxxxvi. 303 (1918). *Eritrichium capituliflorum* Clos in Gay, Fl. Chile iv. 467 (1849). *Cynoglossospermum capituliflorum* Kuntze, Rev. Gen. iii. pt. 2, 204 (1898). *E. cephalanthum* Ph. Anal. Univ. Chile xc. 520 (1895).

ARGENTINA. MENDOZA: Rio Blanco, 2500–3200 m. alt., Jan. 1908, *Hauman 270* (G). SAN JUAN: Los Patos, 3000 m. alt., *Gay 533* (G, photo. of TYPE of *E. capituliflorum*).

CHILE. COQUIMBO: Cordilleras de Doña Ana, *F. Philippi* (MS); (?) hills, Arqueros, Aug. 1836, *Gay 1620* (MS). ACONCAGUA: Juncal, 2400 m. alt., Feb. 1903, *Buchtien 145* (G, US, MS). SANTIAGO: Las Condes, Jan. 1880, *Navarro* (MS, mixed with *C. dimorpha*).

The type of *E. cephalanthum* seems to be lost. Reiche could not find it nor could I locate it at Santiago. However, from the description, it seems to belong clearly to the present species. It was based upon specimens lacking data. The collection from Arqueros, cited above, I suspect to have been mislabeled. The low hills near the coast are scarcely a likely situation for the present high Andean

species. For further notes on this collection see discussion under *C. cynoglossoides*.

25. **C. longifolia** (Ph.) Reiche. Perennial, 1–3 dm. tall; stems several, rather slender, strict, leafy, appressed short-hirsute; leaves oblanceolate, obtuse, gradually reduced up the stem; basal leaves long-petiolate, 7–9 cm. long, 6–8 mm. broad, appressed short-hispid, minutely pustulate; cleistogamic flowers solitary or glomerulate in the leaf-axils particularly below the middle of the stem, inconspicuous; chasmogamic flowers with corollas ca. 3 mm. broad, white, drying brown; spikes bractless, geminate, dense, 1–3 cm. long, in a somewhat thyrsoid arrangement; fruiting calyx oblong, subpersistent, 4–5 mm. long; mature calyx-lobes oblong-linear, erect, densely hispid-villous, midrib not prominent; fruit biovulate; nutlets 1–2, when 2 with the abaxial one bent around beside the axial one, 2–2.2 mm. long, 1–1.2 mm. broad, cuneate-oblong, dark or pale, sometimes mottled, granulate, sparsely tuberculate, apex acute, base obtuse, sides angled, and with thickened edges, back obtuse with a definite medial ridge, inner face right-angled, groove nearly closed though opened at the broad basal forking; gynobase ca. $\frac{3}{4}$ height of nutlets; style much surpassing the nutlets.—Anal. Univ. Chile cxxi. 823 (1908) and Fl. Chile v. 228 (1910). *Eritrichium longifolium* Ph. Anal. Univ. Chile xc. 522 (1895).

CHILE. Coquimbo: La Polcura, Cordillera de Illapel, Jan. 1888, *collector not given* (MS, type; G, photo.).

Evidently related to *C. capituliflora*, but certainly distinct, differing in its habit and in the abundance of pubescence. Much more closely related to *C. spathulata* but a less stiff, more erect plant with more abundant, less rough pubescence on herbage and calyces and having slightly smaller nutlets and a longer style. The known stations for *C. longifolia* and *C. spathulata* are very distant. Both are known, however, only from the type-collection.

26. **C. spathulata** (Ph.) Reiche. Perennial from a strong taproot; stems several, loosely ascending, 1–3 dm. tall, very scabrous, leafy, sparsely appressed short-hirsute; leaves oblanceolate, obtuse or rounded at apex, 2–3.5 cm. long, 6–9 mm. broad, conspicuously pustulate, scabrous, sparsely appressed short-hirsute, lower ones petiolate; cleistogamic flowers solitary or glomerulate in the leaf-axils along the middle part of the stems; chasmogamic flowers with corollas 3–3.5 mm. broad, white, drying brownish; spikes bractless, geminate, numerous, 2–5 cm. long, becoming loose; fruiting calyx oblong, 4–5 mm. long, subsessile, subpersistent; mature calyx-lobes oblong-linear, erect, obtuse, hispid, midrib weakly prominent; fruit biovulate; nutlets 2

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with the abaxial one bent around besides the axial one, 2.5–3 mm. long (the axial one usually the best developed and slightly the darker), ovate-oblong, finely granulate, sparsely tuberculate, apex acute with the very tip blunted, base obtusish, back obtuse with a well developed medial ridge, sides angled with thickened edges, angled ventrally, groove closed except at the broad forking; gynobase ca. $\frac{2}{3}$ height of nutlets; style equalling height of nutlets or definitely surpassing them. —Anal. Univ. Chile cxxi. 823 (1908) and Fl. Chile v. 228 (1910). *Eritrichium spathulatum* Ph. Anal. Univ. Chile xc. 517 (1895); not *E. spathulatum* Clarke (1883).

CHILE. COLCHAGUA: Cordilleras de Popeta, 1881, *F. Philippi* (MS, TYPE; G, photo.).

This species is readily separated from the other coarse perennials by its very sparsely pubescent and quite scabrid herbage. It is known only from the type-collection.

27. **C. glomerata** Lehm. Annual; plant usually erect, 1–5 dm. tall, more or less hispid or hirsute and frequently finely pubescent as well; stems one or several, shortly branched above or occasionally loosely branched from the base; leaves lanceolate to lance-linear or lance-ovate, 1–4(–5) cm. long, 2–8 mm. broad, from a broad rounded sessile base usually tapered to an acute apex, reduced up the stem and extending into the inflorescence; cleistogamic flowers biovulate, solitary or in glomerules or in short bracted spikes produced in the leaf-axils, always present in the upper axils and commonly in all the axils down to the base of the plant, commonly much more abundant than the chasmogamic flowers, corolla very poorly developed and inconspicuous, fruiting structures as in chasmogamic flowers though averaging slightly smaller; chasmogamic flowers usually not abundant and occasionally absent, restricted to and dominating the normal true terminal spikes which are 1–3(–5) cm. long, solitary or geminate or even ternate and are bracted only at base; corolla 3–4 mm. broad; fruiting calyx oblong-ovate to oblong, 1.5–3(–4) mm. long; mature calyx-lobes linear to linear-lanceolate, notably unequal, hispid or hirsute; fruit biovulate or rarely quadriovulate; nutlets 2 or rarely 4, 1.3–2 mm. long, tuberculate and coarsely granulate, ovate or oblong-ovate, more or less triquetrous, apex acute, base obtuse, edges decidedly angled and usually somewhat thickened, back convex; groove usually open, dilated towards the base where divaricately forked; style from slightly shorter to definitely surpassing the nutlets; gynobase about $\frac{2}{3}$ height of nutlets.—Lehm. ex F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836); Don, Gen. Syst. iv. 373 (1838); Greene, Pittonia

i. 110 (1887); Reiche, Anal. Univ. Chile cxxi. 817 (1908) and Fl. Chile v. 222 (1910). *Cryptantha microcarpa* F. & M. l. c.; Don, l. c.; Greene, l. c. 111; Reiche, l. c. 818 and l. c. 223. *Eritrichium cryptanthum* A. DC. Prodr. x. 129 (1846); Clos in Gay, Fl. Chile iv. 463 (1849). *E. clandestinum* A. DC. l. c.; Clos, l. c. *Krynitzkia clandestina* Gray, Proc. Am. Acad. xx. 274 and 280 (1885). *E. clandestinum*, var. *angustifolium* A. DC. l. c. 130; Clos, l. c. *E. clandestinum*, var. *decumbens* A. DC. l. c. 130; Clos, l. c. *E. congestum* A. DC. l. c. 132; Clos, l. c. 465. *Cynoglossum congestum* Poepp. in herb. fide A. DC. l. c. 132. *Cryptantha congesta* Greene, l. c. 111; Reiche, l. c. 816 and l. c. 221. *E. asperum* Ph. Linnaea xxix. 16 (1857). *E. strictum* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 213 (1860); not *E. strictum* Decne. (1844). *Cryptantha microcarpa*, var. *stricta* Reiche, l. c. 818 and l. c. 223. *E. longisetum* Ph. Linnaea xxxiii. 189 (1864) and Anal. Univ. Chile xc. 538 (1895). *Cryptantha glareosa*, var. *longiseta* Reiche, l. c. 820 and l. c. 225. *E. Vidali* Ph. Anal. Univ. Chile xc. 525 (1895). *Cryptantha Vidali* Reiche, l. c. 817 and l. c. 222. (?) *E. diplasianthum* Ph. Anal. Univ. Chile xc. 530 (1895). *E. foliosum* Ph. Anal. Univ. Chile xc. 533 (1895). *C. foliosa* Reiche, l. c. 827 and l. c. 232. *Cryptantha Candolleana* Brand in Fedde, Repert. xx. 48 (1924). *Cryptantha Philippiana* Brand, l. c. 319.

CHILE. MAULE: Constitucion, *Azocart* (MS, TYPE of *E. foliosum;* G, photo.). COLCHAGUA: Colchagua, *Gay* (G, photo. of TYPE of *E. clandestinum*, var. *angustifolium*). OHIGGINS: Peumo, Sept. 1921, *Claude-Joseph 1434* (US). SANTIAGO: San Cristobal, Nov. 4, 1877, *no collector given* (MS); Cerro San Cristobal, Sept. 1917, *Skottsberg 976* (G); Santiago, 1840, *Gay 1619* (MS); Santiago, *no collector given* (MS); Santiago, *Claude-Joseph 1377, 2234* and *2881* (US); Nuñoa, Nov. 1922, *Claude-Joseph 2107* (US); Renca, Oct. 1883, *no collector given* (MS); Cerro de Renca, 1877, *no collector given* (MS); Cerro de Renca, Nov. 1906, *Reiche* (MS); San Bernardo, Oct. 1877, *no collector given* (MS); San Miguel, Oct. 1879, *no collector given* (MS); Santa Rita, Oct. 12, 1879, *no collector given* (MS); San Antonio, *Claude-Joseph 1734* and *2869* (US); Lo Prado, Oct. 1924, *Claude-Joseph 2806* (US). VALPARAISO: near Viña del Mar, Oct. 19, 1894, *Buchtien 145* (MS); sands, near Viña del Mar, Sept. 1, 1895, *Buchtien* (US); along roads, Valparaiso, Oct. 19, 1895, *Buchtien* (US); Valparaiso, Oct. 1925, *Claude-Joseph 3638* and *3639* (US); Valparaiso, 1879, *no collector given* (MS); Valparaiso, *Cumings 513* (G); Valparaiso, 1836, *Gaudichaud 122* (G, photo. of COTYPE of *E. clandestinum*, var. *decumbens*); Quintero, ca. 20 m. alt., Sept. 1923, *Werdermann 40* (G, US, FM); La Calera, 1865, *no collector given* (MS); Curuma, 1883, *Philippi* (MS, ISOTYPE of *C. Philippiana;* G, photo.); near Rio Quillota, Oct. 1828 *Bertero 1157* (G, NY, US); Limache, [? *Bertero*] (NY). ACONCAGUA: Catema, Sept. 1860, *no collector given* (MS, TYPE of *E. longisetum;* G, photo.); Islota Huevos, Los Vilos, Nov. 20, 1889, *Vidal* (MS, TYPE of *E. Vidali;* G, photo.); Zapallar, 1908, *Johow* (IP). COQUIMBO: vicinity of Choapa, Oct. 6, 1914, *Rose 19218* (US, NY); Talahuen, 1889–90, *Geisse* (G, MS); Frai Jorge Estancia, Aug. 13, 1917, *Skottsberg 748* (G); Coquimbo, Nov. 1893, *no collector given* (MS, TYPE of *E. asperum;* G, photo.); Coquimbo, Sept. 1885, *no collector given* (MS, G, photo.). ANTOFAGASTA: open slope above Aguada Lora,

Cerro Perales, Taltal, Dec. 1925, *Johnston 5630* (G); thickets at lower edge of fertile belt, El Rincon near Paposo, Dec. 1925, *Johnston 5542* (G); gravelly talus, Aguada Panul, Dec. 1925, *Johnston 5447* (G); Miguel Diaz, 1853, *Philippi* (MS, TYPE of *E. strictum;* G, photo.); steep hillside, Tocopilla, Oct. 1925, *Johnston 3577* (G). INDEFINITE: Cerro de Bravos, Oct. 23, 1881, *no collector given* (MS); San Juan de Pirque, 1914, *Baeza* (IP); costa, Nov. 4, 1920, *Claude-Joseph 1222* (US); Chile, 1828, *Poeppig 193* (G, photo of TYPE of *E. congestum*).

As here taken *C. glomerata* is extremely variable. While it is possible that future studies will show it as breaking up into several varieties or even close species, the material I have had for study is not sufficiently extended to form a satisfactory basis for the segregation, at this time, of this polymorphous though certainly very natural assemblage of forms. Thus interpreted the species is readily recognized in its section by its annual habit, its usually very numerous cleistogamic flowers and its more or less lanceolate leaves, which from a broad rounded sessile base are usually contracted to an acute apex. In habit of growth, leaf-proportions, pubescence and even in nutlets there is considerable variation. This variation seems to be quite erratic, for I have been unable to detect concomitant variation in unrelated characters. The great variation in gross habit is due partly to environment and partly to the varying abundance of cleistogamic flowers. The cleistogamic flowers are always present in considerable numbers, at times to the complete exclusion of the chasmogamic flowers. The extreme latter condition is apparently that represented by the type of *C. glomerata.* This form has simple bracted spikes and is usually more densely and abundantly branched than the more common form in which the stem is terminated by 2–3 bractless spikes of conspicuous chasmogamic flowers.

Eritrichium Vidali, from a coastal islet off the Department of Petorca, is a peculiar form with broad leaves, the uppermost of which are lance-ovate. *Eritrichium foliosum*, from Constitucion, is a low coastal form with coarse stems and leaves. The type-collection sets a point on the southern limit of the genus in Chile. *Eritrichium asperum* from Coquimbo is notable for its slightly smallish calyces which seem somewhat more villous than in the plant from further south. *Eritrichium longisetum* is a small slender plant with few chasmogamic flowers. *Cryptantha Philippiana* is similarly small and slender, but has the chasmogamic flowers well developed and dominating. The type of *E. diplasianthum* is apparently lost, though judging from descriptions it seems to belong clearly to *C. glomerata.* A very striking form is that plant of the coastal hills of the Province of Antofagasta described as *E. strictum.* Though widely detached geographically, *E. strictum* forms part of the spring-flora of the fog-

bathed lomas which has a very strong affinity with the flora of central Chile in which the main range of *C. glomerata* falls. Reiche treated *E. strictum* as a variety of *C. microcarpa*, but the characters he enumerates for it do not hold in light of the new material recently collected. While the plant has a fairly characteristic coarse gross habit and a very detached range it does not seem to be decisively separated from *C. glomerata.*

28. **C. alfalfalis** (Ph.), comb. nov. Annual, 3–4 dm. tall; stems stiff, subsimple or loosely and ascendingly long-branched, somewhat cinerescent, finely appressed or spreading villous-hispid; basal leaves linear, becoming 6 cm. long; stem-leaves linear or lanceolate, obtusish, firm, 2–3 cm. long, 2–3.5 mm. broad, finely pustulate; cleistogamic flowers very numerous, solitary or glomerate in the leaf-axils or in small-bracted spikes terminating the stems and branches, calyx and fruit similar to those of the chasmogamic flowers; chasmogamic flowers very few, mixed with the cleistogamic flowers in the terminal solitary or geminate spikes; corolla not conspicuous, ca. 2 mm. broad; fruiting calyx ovate or oblong-ovate, 2–3 mm. long, subsessile; mature calyx-lobes narrowly lanceolate, connivent above, hirsute especially on the thickened midrib; flowers biovulate; nutlets 1–2, axial one always present and most persistent, ovate-oblong, somewhat compressed, 2.5–3 mm. long, 1.3–1.5 mm. broad, densely verrucose, apex acute, base truncate, sides acute, back obtuse, groove closed or open and broadly forked below; gynobase $\frac{2}{3}$–$\frac{3}{5}$ height of nutlets; style shortly but definitely surpassing the nutlets.—*Eritrichium alfalfalis* Ph. Anal. Univ. Chile xc. 525 (1895); Reiche, Anal. Univ. Chile cxxi. 831 (1908) and Fl. Chile v. 236 (1910). *E. rigidum* Ph. l. c. 529. *C. rigida* Reiche, l. c. 819 and l. c. 224.

CHILE. SANTIAGO: Rio Colorado, Jan. 1888, *Philippi* (MS, TYPE of *E. alfalfalis;* G, photo.); Rio Colorado, Jan. 1888, *Philippi* (MS, TYPE of *E. rigidum;* G, photo.).

The specific name suggests that the type of this species came from El Alfalfal, a locality on the Rio Colorado in the mountains about 40 km. east of Santiago. The two collections cited probably came from the same locality and represent merely ecological phases of one species. It is quite possible that the plants concerned represent merely very coarse forms of *C. glomerata.* The description given above is incomplete from lack of well developed spikes of chasmogamic flowers, both the cited collections being almost wholly cleistogamic.

29. **C. haplostachya** (Ph.), comb. nov. Erect slender annual ca. 1.2 dm. tall, with several well developed ascending branches, ap-

pressed short-hispid; leaves narrowly lanceolate, 1–1.7 cm. long, 2–3 mm. broad, sessile by a broad rounded base, scabrous, minutely pustulate, apex acute or acuminate; cleistogamic flowers solitary or glomerulate in all the leaf-axils; chasmogamic flowers in a dense short solitary terminal spike 1–1.5 cm. long; corolla ca. 2 mm. broad; fruiting calyx ovate, ca. 1.5 mm. long, subsessile; mature calyx-lobes linear or oblong-linear, densely villous, midrib scarcely developed; flowers biovulate; nutlets 2, opposite one another, firmly affixed, ovate, thick, ca. 1.7 mm. long, 1.5 mm. broad, minutely granulate and coarsely tuberculate, pale, apex acute, base obtuse, back convex or obtuse, sides acute, groove very narrow and broadly forking below; gynobase poorly developed, ca. $\frac{2}{3}$ length of nutlets; style just surpassing the nutlets, short.—*Eritrichium haplostachyum* Ph. Anal. Univ. Chile xc. 537 (1895).

CHILE. ATACAMA: Piedra colgada, Sept. 1885, *no collector given* (MS, TYPE; G, photo.).

More material of this very distinct species is a decided desideratum. It is known only from the type, which is a small, very slender plant in full fruit. Its nearest relation is found in *C. calycotricha* of the Coquimbo region.

30. **C. calycotricha**, sp. nov. Annua ca. 1.5 dm alta basaliter laxeque pauciramosa; ramis ascendentibus delicate adpresseque brevihispidis; foliis adpresse hispidis minute pustulatis obtusis, inferioribus linearibus vel anguste oblanceolatis 3–3.5 cm. longis 3–5 mm. latis, mediis oblongis vel ovato-oblongis late affixis 1–2 cm. longis 5–10 mm. latis, superioribus paullo reductis; floribus cleistogamis in axillis foliorum glomeratis et in parte inferiori spicae productis; floribus chasmogamis albis 2.5–3 mm. latis in spicis geminatis 1–2.5 cm. longis congestis ebracteatis dispositis; calycibus fructiferis ovatis 4–5 mm. longis subsessilibus; lobis calycis linearibus vel oblongo-linearibus vel late lanceolatis obtusis dense molliter villosis fulvescentibus ascendentibus cum costa paullo prominenti; fructu biovulato; nuculis 2 anguste ovatis crassis 1.8–2.1 mm. longis brunneis dense tuberculato-granulatis sparse crasseque tuberculatis vel papillatis apice plus minusve acutis basi obtusis margine angulatis dorse obtusis saepe crasse carinatis, sulcis apicem versus clausis infra mediam in areolam triangularem profundam grandem abrupte ampliatis; gynobasi quam nuculae $\frac{2}{3}$ longiori basim versus crassa medium et apicem versus abrupte contracta; stylo quam nuculae conspicue longiori.

CHILE. COQUIMBO: Frai Jorge, Dept. Ovalle, Sept. 21, 1893, *F. Philippi* (MS, TYPE; G, photo. and frag.).

A very distinct species apparently most related to *C. haplostachya* of the Caldera-Copiapó region but widely differing from it in habit. In the Philippi collections it was found determined as *E. capituliflorum*. Reiche reported that species from Frai Jorge apparently upon the basis of this misdetermination. The plant described and named above is most certainly not closely related to the high Andean *C. capituliflora*.

III. Section GEOCARYA.—This section is characterized by being amphicarpous, producing ordinary spikes of chasmogamic flowers and at the very base of the stem in the lowermost leaf-axils highly specialized cleistogamic flowers. The latter are commonly developed just below the surface of the ground. They are always biovulate, strongly compressed and at maturity become acutely ovate in outline and closely invested by the tough, much accrescent highly modified calyx. The calyx, commonly, is indehiscent, and has the throat conspicuously smaller than the broadly expanded proper tube which tightly invests the fruit. Frequently the mature calyx is strengthened by prominent ribs, these either simple and vertical, or irregularly anastomosing and loosely reticulate. These peculiar cleistogamic flowers at maturity become 3–9 mm. long, 2–5 mm. broad and 1–3 mm. thick. In order to distinguish them from the much simpler cleistogamic flowers developed in the section *Eucryptantha* I have restricted to them, in the present treatment, the term "Cleistogene." Little is known concerning the early growth of these highly specialized structures. In this paper I have described only their mature fruiting condition.

The section is a very natural one and apparently contains some of the most highly evolved members of the genus. With the exception of one high Andean species which occurs just over the Argentine border, the section is entirely Chilean with its center of distribution in the north-central part of the country. It seems to lend itself readily to classification, in fact the principal difficulties in its classification are those concerned with the proper delimitation of *C. linearis*.

KEY TO SPECIES.

Plant a strong-rooted coarse perennial. *Alyssoides*.....31. *C. alyssoides.*
Plant definitely annual.
  Root fleshy and spindleform. *Dimorphae.*
    Spikes bracted; calyx-lobes linear.
      Corolla 5–8 mm. broad; chasmogamic flowers 4-ovulate.
        32. *C. involucrata.*
      Corolla 2–5 mm. broad; chasmogamic flowers 2-ovulate.
        33. *C. Volckmanni.*
    Spikes bractless; calyx-lobes oblong.
      Corolla 2–3 mm. broad; hairs on calyx straw-colored; pubescence on stems loose.....34. *C. dimorpha.*

Corolla 4–5 mm. broad; hairs on calyx bright yellow; pubescence on stems closely appressed.....35. *C. cynoglossoides.*

Root firm and woody, attenuate.

Chasmogamic flowers 2-ovulate. *Lineares.*

Mature calyx 2–2.5(–3) mm. long; nutlets ca. 2 mm. long; cleistogenes rather evidently reticulate-ribbed....36. *C. linearis.*

Mature calyx 3–4.5 mm. long; nutlets 2–3 mm. long; cleistogenes weakly ribbed.....37. *C. aprica.*

Chasmogamic flowers 4-ovulate.

Corolla conspicuous, 4–8 mm. broad; nutlets 2.5–3 mm. long, homomorphous or practically so, back obtuse. *Dolichophyllae.*

Corolla 6–8 mm. broad; leaves narrowly linear, 4–9(–11) cm. long, 1.5–3 mm. broad.....38. *C. dolichophylla.*

Corolla 4–5 mm. broad; linear or narrowly lanceolate, 2–3.5(–4.5) cm. long, 2–3(–5) mm. broad.....39. *C. Gayi.*

Corolla inconspicuous, 1–3 mm. broad; nutlets 1.5–2 mm long, definitely heteromorphous, back convex *Virentes*.....40 *C Kingi.*

31. **C. alyssoides** (DC.) Reiche. Perennial; stems usually several and widely branched, 1–4.5 dm. tall, strigose with fine short silky closely appressed hairs; leaves finely strigose, rarely minutely pustulate, oblanceolate or linear-oblanceolate, obtusish, very much reduced up the stem, lower ones 4–8 cm. long and 3–5 mm. broad; cleistogenes apparently rare, 4–9 mm. long, angulate, irregularly rib-thickened, ovate, finely appressed-pubescent, with ovate-lanceolate brown obscurely and minutely granulate nutlets 4–5 mm. long; spikes minutely and inconspicuously linear-bracted, geminate or solitary, 1–1.5 cm. long, on elongate commonly inconspicuously bracted peduncles; fruiting calyx globose-ovoid, 2–2.5 mm. long, subsessile, subpersistent; mature calyx-lobes oblong-linear or linear-spathulate, obtuse, spreading or appressed short-hispid, rarely with a few short coarse bristles, thickish but without a conspicuous midrib; corolla 3–5 mm. broad, white with a yellowish throat; fruit 2-ovulate; nutlets 1 or 2, the axial one always developing, 2.5–3 mm. long, 1–1.3 mm. broad, dull, densely and minutely granulate-tuberculate and with scattered coarser murications or tuberculations, usually slightly protruding from the calyx, base rounded, apex acute, sides acute, back obtuse with a medial ridge, groove gradually dilated towards the broad open forking; style barely reaching tip of nutlets or just surpassing them; gynobase about $\frac{2}{3}$ height of nutlets.—Anal. Univ. Chile cxxi. 824 (1908) and Fl. Chile v. 229 (1910). *Eritrichium alyssoides* DC. Prodr. x. 131 (1846); Clos in Gay, Fl. Chile iv. 467 (1849); Wedd. Chlor. Andina ii. 88 (1859). *Krynitzkia alyssoides* Gray, Proc. Am. Acad. xx. 280 (1885). *E. Gilliesi* Ph. Anal. Univ. Chile xliii. 517 (1873). *C. Gilliesii* Reiche, l. c. 824 and l. c. 229. *E. talquinum* Ph. Anal. Univ. Chile xc. 517 (1895).

CHILE. SANTIAGO: Maipo, 2700 m. alt., Jan. 1924, *Claude-Joseph 2930* (US); Valle del Yeso, Jan. 1866, *no collector given* (MS, TYPE of *E. Gilliesi;* G, photo.); Mina Cristo, Valle Maipo, 1869–70, *Reed* (G); Paso Cruz, 2200–2300 m. alt., Jan. 1892, *Kuntze* (NY, US). COLCHAGUA: Talcaregua, 1833, *Gay* (G, photo of TYPE of *E. alyssoides*); Agua de la Vida, March, 1875, *no collector given* (MS). TALCA: Cordillera de Talca, Feb. 1879, *F. Philippi* (MS, TYPE of *E. talquinum;* G, photo.).

Cleistogenes do not seem to be abundantly developed by this species. They are probably not produced every year and perhaps only the first season. Among the specimens studied they were found only on the collections made in the Cordillera de Talca by Philippi and at Paso Cruz by Kuntze. I suspect that they have been brushed off in the other collections, for in some of them scars seem to indicate that they were formerly present. In its section the outstanding character of the species is its strong perennial root. Besides its cleistogenes its short broad calyx and general habit further suggest its affinities in the section. The species is very well marked and distinct.

32. **C. involucrata** (Ph.) Reiche. Annual with a fleshy narrowly spindleform root 2–5 mm. thick; stems 1–2 dm. tall, loosely branched, finely short-hispid; leaves oblong-linear to linear or oblong-lanceolate, usually recurving below the obtuse apex, little reduced up the stem, 2–4 cm. long, 2–4 mm. broad, short-hispid, minutely pustulate beneath; cleistogenes in a crowded whorl at the collar of the plant and a few in the lower leaf-axils, calyx not thickened nor reticulate, with usually two bent and unequal smooth or tuberculate nutlets 4–5 mm. long; spikes geminate, bracted, ca. 1 cm. long, glomerate becoming somewhat loosened at maturity; fruiting calyx ovate-oblong, 3–4 mm. long, subsessile; mature calyx-lobes linear, obtuse, erect, short villous-hispid especially above the middle, midrib weak; corollas 5–8 mm. broad, white, usually with brightly orange-colored throat and appendages; fruit 4-ovulate; nutlets 2–4, with the axillary (?) one most persistent, homomorphous, ovate to oblong-ovate, 2–3 mm. long, dull, very minutely and densely tuberculate-granulate and commonly coarsely tuberculate as well, apex acute, base obtuse, back usually obtuse with a weak mid-ridge, edges sharp or merely acute, groove opened or closed and widely forked at base; gynobase subulate, $\frac{1}{2}$–$\frac{2}{3}$ height of nutlets; style almost reaching tip of nutlets or barely surpassing them.—Anal. Univ. Chile cxxi. 830 (1908) and Fl. Chile v. 235 (1910). *Eritrichium involucratum* Ph. Anal. Univ. Chile xliii. 517 (1873).

CHILE. COQUIMBO: Baños del Toro, 1860–61, *Volckmann* (MS. TYPE; G, photo.); Baños del Toro, Jan. 1904, *Reiche* (MS); Baños del Toro, 3500 m. alt., Dec. 1923, *Werdermann 193* (G, US, FM, IP). ATACAMA: Rio Sancar-

ron near Corrales, 3600 m. alt., Jan. 1926, *Johnston 6227* (G); Rio Sancarron below Rucas, 3200 m. alt., Jan. 1926, *Johnston 6226* (G).

33. **C. Volckmanni** (Ph.), comb. nov. Annual 1–1.5 dm. tall, with a fleshy narrowly spindleform root 2–4 mm. thick; stems loosely branched, finely short-hispid; leaves linear, obtuse, little reduced up the stem, 2–3 cm. long, 2–3 mm. broad, short-hispid, minutely pustulate beneath; cleistogenes in a whorl at the collar of plant, a few in the axils above, calyx not thickened nor reticulate, with usually 2 unequal granulate and coarsely tuberculate nutlets ca. 2 mm. long; spikes geminate, bracted, ca. 1 cm. long, glomerate becoming somewhat loosened at maturity; fruiting calyx ovate-oblong, 3–4 mm. long, subsessile; mature calyx-lobes spathulate-linear or linear, obtuse, densely villous-hispid above the middle, with a definite midrib; corolla 2–5 mm. broad, white with orange-colored throat and appendages; fruit 2-ovulate; nutlets 1–2 with the axillary one always developing, ovate, 2–2.5 mm. long, finely and densely tuberculate-granulate and commonly also tuberculate or rugose-tuberculate, apex acute, base rounded, back rounded or somewhat obtuse, edges obtusish, groove gradually dilated towards the broad basal forking; gynobase subulate, ca. $\frac{2}{3}$ height of nutlets; style equalling or somewhat surpassing the nutlets.—*Eritrichum Volckmanni* Ph. Anal. Univ. Chile xviii. 54 (1861) and Linnaea xxxiii. 188 (1864). *E. chrysanthum* Ph. Linnaea xxxiii. 191 (1864). *C. chrysantha* Reiche, Anal. Univ. Chile cxxi. 815 (1908) and Fl. Chile v. 220 (1910).

CHILE. Coquimbo: Huanta, 4000 m. alt., 1860, *Volckmann* (MS, type of *E. Volckmanni;* G, photo.); Cordilleras de Illapel, 1860–61, *Volckmann* (MS, type of *E. chrysanthum;* G, photo.); Cordilleras de Illapel, 2500 m. alt., Jan. 1906, *Reiche* (MS); El Peñon, Andes of Illapel, Jan. 1888, *Philippi* (MS).

Although the type of *C. Volckmanni* is a small immature specimen in flower only, I believe it to be the same as *E. chrysanthum*. The types of both species unquestionably have bracted spikes and biovulate chasmogamic flowers. *Eritrichium chrysanthum* was described as having the corollas "pulchre aurantiaca." The species of the series *Dimorphae* all have white corollas in which the throat and appendages are orange-colored. In drying, the corollas become more or less completely orange-colored or brownish. Hence Philippi's specific name, *chrysanthum*, is misleading.

34. **C. dimorpha** (Ph.) Greene. Annual, 0.5–1.5 dm. tall, irregular and usually laxly branched; root fleshy, spindleform, 2–5 mm. thick; stems usually decumbent, simple or much branched from the base, appressed short-hispid and frequently spreading-hispid as well;

leaves linear-oblanceolate or lanceolate, obtuse or acute, 2–4 cm. long, 2–4(–6) mm. broad, appressed-hispid, rather finely pustulate beneath; cleistogene in crowded whorls at collar of plant and a few in the loser axils, the unribbed calyx densely hispid-villous, the 2 nutlets tuberculate or rugose; spikes geminate or solitary, bractless, capitate-congested, 6–10 mm. long; fruiting calyx globose, 3–4 mm. tall, subsessile, pubescence straw-colored; mature calyx-lobes spathulate-oblong, obtuse, spreading, appressed short-hispid, with midrib; corollas 2–3 mm. broad, white with a small yellow eye; fruit 2-ovulate; nutlets 2 or rarely only the axillary one developing, ovate, 2–3 mm. long, densely and minutely tuberculate-granulate and coarsely tuberculate or tuberculate-rugose as well, apex acute, base obtuse, sides acute, back obtuse with a medial ridge; gynobase $\frac{2}{3}$–$\frac{3}{4}$ height of nutlets; style just surpassed by nutlets or equalling them.—Pittonia i. 112 (1887); Reiche, Anal. Univ. Chile cxxi. 815 (1908) and Fl. Chile v. 220 (1910). *Eritrichum dimorphum* Ph. Linnaea xxix. 16 (1857). *E. himorddo* Ph. Anal. Univ. Chile xviii. 55 (1861), a printer's slip for *E. dimorphum*.

CHILE. SANTIAGO: Las Condes, Jan. 1880, *Navarro* (MS; G, photo.); Arañas, Jan. 1861, *Philippi* (MS; G, photo.); Cordillera de Santiago, Feb. 1857, *Philippi* (MS, TYPE; G, photo.); Las Arañas, Cordillera de Santiago, Nov. 1861, *Philippi* (MS; G, photo.). ACONCAGUA: San Felipe, Dec. 1925, *Claude-Joseph 3857* (US).

Closely related to *C. cynoglossoides*, but a more southern species with a much less trim or erect habit, much paler more spreading pubescence, and smaller corollas.

35. **C. cynoglossoides** (Ph.), comb. nov. Annual, 1–1.5 dm. tall, with a fleshy spindleform root 2–5 mm. thick; stems erect, solitary or tufted, simple or with short (1–3 cm. long) ascending floriferous branches above, finely appressed short villous-hispid; leaves lanceolate to linear-oblong or oblong-lanceolate, 2–4 cm. long, 2.5–5 mm. broad, usually recurved just below the obtuse or rounded apex, appressed-hispid, little reduced up the stem; cleistogenes in crowded whorls at crown of plant, a few in the lower axils, with the membranous unribbed calyx surpassed by the nutlets, the two densely tuberculate nutlets ca. 5 mm. long; spikes solitary or geminate, bractless, very densely capitate-congested, ca. 1 cm. long; fruiting calyx globose, 3–4 mm. long, the hairs bright yellow or darkly tawny; mature calyx-lobes oblong, obtuse, ascending, densely short-hispid, midrib not prominent; corolla 4–5 mm. broad, white with orange-colored tube and appendages; flowers 2-ovulate; nutlets 2 or rarely with only the axillary one developing, 2.5–3 mm. long, finely and densely tuber-

culate-granulate and also commonly tuberculate or tuberculate-rugose as well, apex acute, base obtuse, back obtuse with a weak medial ridge, edges angled, groove usually closed with a small areola at the broad forking; gynobase about $\frac{2}{3}$ height of nutlets; style surpassing the nutlets.—*Eritrichum cynoglossoides* Ph. Linnaea xxix. 16 (1857). *E. uspallatense* Ph. Anal. Univ. Chile xc. 521 (1895).

ARGENTINA. MENDOZA: Baños del Inca, Jan. 1886, *Borchers* (MS, TYPE of *E. uspallatense;* G, photo.). SAN JUAN: Arroyo Tambillo below Paso de Valeriano, 4000 m. alt., Jan. 1926, *Johnston 6099* (G).

(?) CHILE: "Arqueros, Oct. 1836, *Gay*" (MS, TYPE of *E. cynoglossoides;* G, photo.).

The source of the type specimens of *E. cynoglossoides* is uncertain. It was found by Philippi mixed with specimens of *C. capituliflora* on a sheet in the Museo Nacional at Santiago. The accompanying label bears Gay's number 1620 and gives the collection-locality as Arqueros, a small mining district at relatively low altitudes in the hills back from the coast in the northwestern part of the Province of Coquimbo, Chile. The flora of this region is very different from that in which both *C. cynoglossoides* and *C. capituliflora* are with certainty known. I suspect that the specimens in question really came from the cordilleras east of Coquimbo and were attributed to Arqueros through mislabeling. Perhaps pertinent in this connection is the fact that the type of *C. capituliflora* at Paris presents a mixture similar to that described. A photograph of Clos's type of *C. capituliflora* shows that a single plant of *C. cynoglossoides*, or at least of some closely related species, is associated with the plants of *C. capituliflora*. It is significant that the single plant is remarkably similar in size, habit and degree of maturity to the type of *C. cynoglossoides* at Santiago, in short they might be part of the same collection. The sheet at Paris bears Gay's number 533 and is labeled as from Los Patos, a high Andean valley just within Argentina (Prov. San Juan) and southeasterly from Coquimbo. I am inclined to believe that the type of *C. cynoglossoides* really came from Los Patos and I should not be surprised if future collecting shows that species to be strictly Argentinian.

36. **C. linearis** (Colla) Greene. Annual, 1–3 dm. tall, stiffly erect, with a firm slender root 1–2.5 mm. thick; stems solitary or few, slender, producing short ascending branches above, strigose or loosely appressed short hispid-villous; leaves spathulate-linear or narrowly lance-linear, acutish, 2–5(–7) cm. long, 2–3(–4) mm. broad, scarcely reduced up the stem, somewhat hispid, silky-strigose; cleistogenes few, borne at collar of plant or occasionally in lower axils, with an apparently indehiscent calyx that is pubescent and rather evidently reticulate-

ribbed, the 1–2 ovate-oblong nutlets smooth or obscurely tuberculate; spikes geminate or ternate, bractless, 2–6 cm. long, usually becoming loosely flowered at maturity; fruiting calyx oblong, 2–2.5(–3) mm. long, base conical and usually tapered off into a short pedicel, rarely subsessile; mature calyx-lobes linear, erect, usually rather densely short villous-hispid, midrib short-hirsute; corolla white, 2–5 mm. broad; fruit 2-ovulate; nutlets usually solitary, axillary, inflexed, densely tuberculate or verrucose, ashy or brown, ovate, 1.5–2 mm. long, 1–1.3 mm. broad, apex acute, base rounded, back obtuse, sides usually acute, groove open; gynobase $\frac{1}{4}$– $\frac{2}{3}$ height of nutlet; style much surpassing or at least equalling the nutlet.—Pittonia i. 111 (1887); Reiche, Anal. Univ. Chile cxxi. 814 (1908) and Fl. Chile v. 219 (1910). *Myosotis linearis* Colla, Mem. Acad. Torino xxxviii. 129, t. 42, fig. 2 (1835). *Eritrichium lineare* DC. Prodr. x. 131 (1846); Clos in Gay, Fl. Chile iv. 469 (1849). *Krynitzkia linearis* Gray, Proc. Am. Acad. xx. 280 (1885). *E. lineare*, var. *sericeum* A. DC. l. c. *C. linearis*, var. *sericea* Reiche, l. c. *E. minutiflorum* Ph. Linnaea xxxiii. 190 (1864). (?) *C. minutiflora* Brand in Fedde, Repert. xx. 319 (1924). *E. fallax* Ph. Anal. Univ. Chile xc. 518 (1895). *C. fallax* Reiche, l. c. 817 and 222; not *C. fallax* Greene (1902). *E. gracile* Ph. Anal. Univ. Chile xc. 519 (1895). *C. gracilis* Reiche, l. c. 816 and l. c. 221. *E. affine* Ph. Anal. Univ. Chile xc. 523 (1895).

CHILE. TALCA: Talca, Corinto, 1913, *Espinosa* (IP); Peumo, Sept. 1921, *Claude-Joseph 1433* (US); Talca, Oct. 1921, *Claude-Joseph 1650* (US); Mondaca, Cord. Talca, 1861–62, *Volckmann* (MS). COLCHAGUA: San Fernando, Sept. 1864, *Philippi* (MS); Colchagua, Nov. 1860, *Landbeck* (MS, TYPE of *E. minutiflorum;* G, photo.); hills, Prov. Colchagua, *Gay 1626* (MS). OHIGGINS: Cocalan, 1913, *Baeza* (IP); Rancagua, Oct. 1878, *Bertero 444* (G, NY; ISOTYPES of *M. linearis* ?). SANTIAGO: Renca, Oct. 1877, *Philippi* (MS); fields, San Cristobal, Santiago, Aug. 1830, *Gay 1629* (MS); Nuñoa, Nov. 1922, *Claude-Joseph 2107* in pt. (US); Cajon del Arragua, Oct. 1859, *Philippi* (MS). VALPARAISO: rocky hills, Quillota, 1829, *Bertero 1158* (NY). COQUIMBO: vicinity of Illapel, Oct. 1914, *Rose 19269* (NY, US); Coquimbo, 1856, *Harvey* (G); Coquimbo, Nov. 1864, *Philippi* (MS); Coquimbo, Sept. 1885, *Philippi* (MS, TYPE of *E. affinis;* G, photo.). INDEFINITE: Chile, *Reed* (G); Chile, *Gillies* (NY, G); central Chile, *Reid* (NY); collection without data (MS, a fragment of TYPE of *E. affine* ?).

The type of *E. fallax* is lost. However a study of the original descriptions leaves little doubt that it is a synonym of the present species. The only material I could find at Santiago of *E. affine* is a small fragment determined by Philippi. This material is certainly referable to *C. linearis*.

37. **C. aprica** (Ph.) Reiche. Annual 1–4(–5.5) dm. tall, with a firm root 2–4 mm. thick; stems solitary or rarely several, usually erect and loosely branched, sparsely strigose and hispid; leaves linear-lan-

ceolate to linear, acute, 2–5(–10) cm. long, 1.5–3(–4) mm. broad, strigose and hispid; cleistogenes few, produced at the collar of the plant, the pubescent weakly ribbed calyx apparently indehiscent, the 1 or 2 nutlets smooth or obscurely tuberculate; spikes geminate or ternate, bractless, 2–5 cm. long, elongating and loosening at maturity; fruiting calyx ovate to obliquely ovate-oblong, 3–5 mm. long, pedicellate or subsessile; pedicels short or evident, slender, 1–2 mm. long; mature calyx-lobes lance-linear, connivent, somewhat villous-hispid, the midrib sparsely hirsute; corolla white, 3–4 mm. broad; fruit biovulate; nutlets commonly 1, axillary, ovate or oblong-ovate, incurved, verrucose or muricate, 2–2.5(–3) mm. long, back obtuse, apex acute, base obtuse, sides acute, groove gradually dilated towards the broad open forking; gynobase about $\frac{2}{3}$ length of nutlets; style much surpassing the nutlets or at least equalling them.—Anal. Univ. Chile cxxi. 814 (1908) and Fl. Chile v. 219 (1910). *Eritrichum apricum* Ph. Linnaea xxxiii. 190 (1864). *E. Bridgesii* Ph. Anal. Univ. Chile xc. 515 (1895). *E. lignosum* Ph. Anal. Univ. Chile xc. 524 (1895). *E. denudatum* Ph. Anal. Univ. Chile xc. 527 (1895). *E. Closii* Ph. Anal. Univ. Chile xc. 528 (1895). *E. Rengifoanum* Ph. Anal. Univ. Chile xc. 529 (1895). *Plagiobothrys rufescens*, var. *Renjifoanus* Reiche, l. c. 812 and l. c. 217. *C. candelabrum* Brand in Fedde, Repert. xx. 47 (1924). *C. congesta* of Reiche, l. c. 816 and l. c. 221; not DC.

CHILE. SANTIAGO: Lampa, Nov. 1, 1864, *Philippi* (MS, TYPE of *E. Bridgesii;* G, photo.); Lampa, Nov. 1, 1864, *Philippi* (MS, TYPE of *E. lignosum;* G, photo.); Lampa, *Philippi* (MS, TYPE of *E. Closii;* G, photo.); collection without data [from Lampa ?], (MS, TYPE of *E. denudatum;* G, photo.); Salto de Agua, Valle Ramon, Nov. 1860, *Philippi* (MS, TYPE of *E. Rengifoanum;* G, photo.); Santiago, *Philippi* (G, frag. of TYPE of *C. candelabrum*). ACONCAGUA: Cajon del Boldo, Catemu, Sept. 1860, *Philippi* (MS, TYPE of *E. apertum;* G, photo.). COQUIMBO: vicinity of Choapa, Oct. 6, 1914, *Rose 19217* (NY, US). ATACAMA: (?) Quebrada de Serna, 1885, *San Roman* (MS; G, photo.).

A very close relative of *C. linearis*, with which it appears to intergrade and of which it may possibly be only a large coarse phase. The proper status of *C. aprica* can not be ascertained from herbarium studies alone. Until reliable field observations are made the species must remain one of dubious status.

The collection made by San Roman in Quebrada de Serna, which I have cited above, is incomplete and fragmentary and is very doubtfully referred to the present species. Although in many ways suggesting *C. Gayi* rather than *C. aprica* it has biovulate chasmogamic flowers which make it fit best, for the time being, in the latter species. It is a stiff coarse plant 1.5–2 dm. tall which has dried very dark, the

pubescence is denser, the calyx is coarser and the nutlets seem less densely and finely roughened than in *C. aprica*. The plant is a peculiar one and more collections are much needed. I suspect that it will be found to be worthy of specific recognition.

38. **C. dolichophylla** (Ph.) Reiche. Annual, 1.5–2.5 dm. tall, with a firm root 2–4 mm. thick; stems erect, usually loosely and ascendingly branched, leafy, strigose and hispid; leaves linear, ascending, 4–9(–11) cm. long, 1.5–3 mm. broad, acute; cleistogenes few, borne at collar of plant, the calyx pubescent with thickened ribs, the two unequal nutlets smooth or tuberculate; spikes geminate or ternate, bractless, becoming 1–2 cm. long or perhaps longer; fruiting calyx ovate-oblong, 4–5 mm. long, subsessile; mature calyx-lobes lance-linear, erect, appressed hispid-villous, sparsely hirsute on the weakly. thickened midrib; corolla very conspicuous, 6–8 mm. broad, white; flowers 4-ovulate; nutlets 4, homomorphous, oblong-ovate, 2.5–3 mm long, transversely rugose or somewhat verrucose-rugose especially towards base, sides acute, apex acute, back obtusish; gynobase ca. $\frac{2}{3}$ height of nutlets; style very much surpassing nutlets, about half again as long as the gynobase.—Anal. Univ. Chile cxxi. 830 (1908) and Fl. Chile v. 235 (1910). *Eritrichium dolichophyllum* Ph. Anal. Univ. Chile xc. 520 and 522 (1895).

CHILE. Coquimbo: Paihuano, Dept. Elqui, 1884, *Peralto* (MS, type; G, photo.); Frai Jorge Estancia, Dept. Ovalle, Aug. 13, 1917, *Skottsberg* (G).

39. **C. Gayi**, sp. nov. Annua erecta 1.5–3.5 dm. alta e radice firma 3–4 mm. crassa oriens; caulibus solitariis breviter ascendenterque ramosis sparse breviterque hispidis; foliis linearibus vel anguste lanceolatis 2–3.5(–4.5) cm. longis 2–3(–5) mm. latis late sessilibus acutiusculis adpresse hispidis subtus minute pustulatis; cleistogeneis (fide tab. Gayi) ad collum plantae congestis ovatis 5–6 mm. longis, calycibus costatis, nuculis 2; apicis geminatis vel ternatis 1–3(–4) cm. longis ebracteatis; calycibus fructiferis ovatis 3–4 mm. longis brevissime pedicellatis vel sessilibus; lobis calycis maturitate lanceolatis vel oblongis erectis dense hispidis costa paullo encrassatis; corolla alba 4–5 mm. lata; fructu 4-ovulato; nuculis (1–)4 (axillare paullo differentiata) 2.5–3 mm. longis dense minuteque granulatis sparse tuberculatis pallidis ovato-oblongis apice acutis dorso obtusis medio longitudinaliter costatis marginibus acutis ventre $\frac{2}{3}$ longitudinis ad gynobasem affixis; stylo nuculas evidenter superanti gynobasi aequilongis.

CHILE. Coquimbo: Arqueros, Dept. La Serena, Oct. 1836, *Gay 1921* (MS, type; G, photo. and frag.).

In gross habit and in details the plant described above agrees so very closely with that illustrated under the name *Eritrichium phaceloides* by Gay, Fl. Chile. t. 52 bis (1854), that I believe them to represent the same species if not parts of the same collection. The specimens which I studied unfortunately lacked the base of the stem. Hence I can not say positively that it produced cleistogenes, although I feel confident that it did so. In the above description the cleistogenes are described from Gay's plate. In the illustration the corollas are shown as light blue in color, but this is no doubt a mistake. True *C. phaceloides*, with which this species has been somehow confused, is a valid species of the section *Krynitzkia*.

40. **C. Kingi** (Ph.) Reiche. Annual, 1–3 dm. tall, with a firm slender root 2–3 mm. thick; stems short-hispid, usually solitary, ascendingly branched; leaves lance-linear or lanceolate, 1–3(–5.5) cm. long, 2–4(–6) mm. broad, base rounded, apex acute, finely pustulate beneath; cleistogenes not numerous, borne at collar of plant and a few in the lower axils, 6–8 mm. long, the conspicuously ribbed calyx finely appressed-hispid, the 2 unequal nutlets smooth or obscurely roughened and 5–7 mm. long; spikes geminate or ternate or solitary, bractless, congested or even glomerate but loosening somewhat in age, 1–2 cm. long; fruiting calyx ovate-oblong, 4–5 mm. long, usually definitely pedicellate; pedicels almost 1 mm. long; mature calyx-lobes lance-linear, erect, short villous-hispid, hirsute along the thickened midrib; corolla small or inconspicuous, white, 1–3 mm. broad, subtubular or with an evident limb; fruit 4-ovulate; nutlets 4, definitely heteromorphous, narrowly ovate, minutely tuberculate, apex acute, sides sharp, base truncate, back convex, groove narrow or closed and widely forking at base; odd nutlet axial, largest and most persistent, 1.8–2 mm. long; consimilar nutlets 1.5–1.8 mm. long; gynobase ca. $\frac{2}{5}$ height of odd nutlet; style surpassing odd nutlet, about $\frac{2}{3}$ length of gynobase.—Anal. Univ. Chile cxxi. 815 (1908) and Fl. Chile v. 220 (1910). *Eritrichium Kingi* Ph. Anal. Univ. Chile xc. 516 (1895); not *E. Kingii* Wats. (1871). *E. virens* Ph. l. c. 519. *C. virens* Reiche, l. c. 826 and l. c. 231. *E. macrocalyx* Ph. l. c. 536. *C. macrocalyx* Reiche, l. c. 825 and l. c. 230. *C. campylotricha* Brand in Fedde, Repert. xx. 47 (1924).

CHILE. ATACAMA: Bandurrias, 1885, *Geisse* (MS; G, photo.); Bandurrias, 1887, *Geisse* (MS, TYPE of *E. virens;* G, photo.); Desert of Atacama [? Bandurrias], *Geisse 25* (NY); Quebrada de Chanchoquin near Copiapó, Oct. 1885, *Gigoux* (G); Caldera, Oct. 1894, *Gigoux* (G); Caldera, Aug. 1876, *Stübel 30* (G, frag. TYPE of *C. campylotricha*); Caldera, Nov. 1925, *Johnston 5060* (G); Caldera, Sept. 1885, *no collector given* (MS, TYPE of *E. macrocalyx;* G, photo.); Desert of Atacama [Caldera region], *Morong 1250* and *1343* (NY).

This species is readily recognized in its section by its heteromorphous nutlets. It varies considerably in gross habit. Perhaps worthy of some recognition is the subsimple, strictly erect, rather coarse form from Caldera represented by *Morong 1343*, *Johnston 5060* and the type of *E. macrocalyx*. I believe, however, that it is ecological, being probably a xerophytic dune-form. It is evidently not geographically separated from the slender more branched phase, for a collection made at Caldera by Gigoux is very similar to the plant from Bandurrias.

Cryptantha campylotricha I refer to the present species. Through the kindness of Dr. Brand I have had a bit of the type of *C. campylotricha* for study. Dr. Brand makes much of certain apically reflexed hairs found on the calyx of the cleistogenes. I have found some uncinate or contorted hairs on the cleistogenes of such collections as *Geisse 25* and Gigoux's material from Caldera. Though very regular I believe this bending of the hairs to have resulted from drying and pressing of the specimens.

I have not seen the type of *C. Kingi* unless a certain specimen in the Philippi herbarium lacking data may be it. The original description of the species however seems to leave little doubt as to its identity. It is to be hoped that, although the type is lost or unrecognizable at Santiago, authentic material of the species may be found in some other herbarium.

Doubtful or Excluded Species.

Cryptantha Hossei Brand in Fedde, Repert. xx. 49 (1924)—This species, based upon *Hosseus 1531* from the vicinity of Vegas del Descubrimiento Nuevo in La Rioja, Argentina, apparently belongs to the section *Eucryptantha*. It is described as a very hispid erect annual, much branched from the base, and only ca. 6 cm. tall. I have received fragments of the type from Dr. Brand and find that the fruiting and flowering parts much suggest *C. glomerulifera*. The nutlets, however, seem to be less broad and more tuberculate than in that species and the low annual habit quite different. The species may be worthy of recognition.

Cynoglossum pauciflorum R. & P. Fl. Peruv. ii. 6 (1799); Lehm. Asperif. i. 139 (1818); Reiche, Anal. Univ. Chile cxxi. 250 (1907) and Fl. Chile v. 208 (1910).—The type of this unrecognized species is said to have come from Concepcion, Chile. Recent writers have seemed to think it is a *Cryptantha* although no species of that genus is known to grow within the area about Concepcion from which it is reported that Ruiz & Pavon obtained material. Possibly it is a *Plagiobothrys*.

Eritrichium glabratum Ph. Cat. Pl. Itin. Tarapaca 56 (1891).—This species is a synonym of HELIOTROPIUM CHENOPODIACEUM, var. ERICOIDES (Miers) Reiche.

10. **Nesocaryum**, gen. nov.

Calyx cylindraceus costatus late et oblique affixis apice 5-dentatus fructifer valde auctus latere abaxillare supra basem appendiculum (bracteam decurrentem) oblongum gerens. Corollae tubus breviter cylindricus calyci subaequalis intus infra medium cum 10 lamellis elongatis ornatus; lobis 5 ovatis imbricatis patentibus; fauce cum appendiculis 5 trapeziformibus intrusis clausa. Stamina 5 medio tubi affixa inclusa; filamentis brevissimis subulatis compressis; antheris oblongis obtusis quam filamenta multo longioribus. Stylus filiformis inclusus; stigmate capitato discoideo integerrimo. Ovulae 4. Semina recta, crassa; cotyledones integrae. Nuculae 4 erectae ovatae immarginatae tuberculatae latere interiore obtusae sulco medio-longitudinali basi furcato infra medium ad gynobasem subulatam affixae. —Fruticulus canescens insulae chilensis Sancti Ambrosiae dictae incola. Folia alterna oblanceolata breviter petiolata. Spicae geminatae. Corolla alba.—Nomen ex origine insulari a νῆσος, insula et κάρυον, nux, derivatur.

1. **Nesocaryum stylosum** (Ph.), comb. nov. Shrub (probably a small one), closely appressed canescent-strigose throughout; leaves oblanceolate, 2–4 cm. long, 2–5 mm. broad, veinless and rather firm, acute, strigose and finely pustulate, tapering off below into a short narrowly winged petiole; leaf-bases persistent and roughening the stem; spikes geminate, very densely flowered, ca. 1–1.5 cm. long, rachis firm and tortuous, provided with long bracts decurrent on and coalescent with the base of the calyx; calyx firm, strigose, broadly obliquely and permanently attached to the rachis of the spike, on abaxial side above the base bearing a strict linear or narrowly spathulate appendage (the free end of the decurrent floral bract) reaching to the tip of the lobes; calyx at anthesis narrowly campanulate, ca. 3 mm. long, lobed $\frac{1}{3}$ to base; calyx at maturity decidedly accrescent, cylindrical, 6 mm. long, lobed $\frac{1}{5}$ to base, the tube ribbed; calyx-lobes deltoid or at least triangular, unequal, usually green; corolla white, with a flat limb 6–7 mm. broad; corolla-tube about equalling calyx, ca. 3 mm. long, glabrous inside and out, ca. 1.2 mm. thick, slightly contracted towards the base, inside the lower $\frac{2}{5}$ bearing 5 pairs of elongate protruding lamellae (a pair below each stamen-insertion) which are broadest (ca. 0.18 mm.) slightly thickened and abruptly rounded off at the upper end and are gradually contracted in width

towards the base of the tube; stamens borne about middle of tube, ca. 0.7 mm. below throat; filaments subulate, compressed, ca. $\frac{1}{3}$–$\frac{1}{4}$ length of anthers; anthers oblong, obtuse, 0.8–1 mm. long; corolla-throat with 5 small (ca. 0.5 mm. long) emarginate glabrous trapeziform appendages of intruded tissue; corolla-lobes obovate, ca. 3 mm. long, rounded, spreading; nutlets (only slightly immature ones seen) 2–4, ovate-oblong, ca. 1.6 mm. long, ca. 0.6 mm. broad, minutely tuberculate, homomorphous, broadest ca. 0.5 mm. above base, gradually tapering above towards the acutish apex and rounded off below towards the truncate base, back convex, sides acute below and rounded towards apex, the groove open, narrow, abruptly dilated at forking to form a small deltoid areola; gynobase subulate, ca. $\frac{2}{3}$–$\frac{3}{4}$ height of nutlets, 4-angled; style long, very much surpassing nutlets, ca. 1.5 mm. long.—*Heliotropium stylosum* Ph. Bot. Zeit. xxviii. 500 (1870) and Anal. Univ. Chile xlvii. 191 (1875); Hemsley, Bot. Challenger i. pt. 3, 100 (1884); Reiche in Eng. & Drude, Veg. Erde viii. [Grundz. Pflanzenverb. Chile] 269 (1907); Reiche, Anal. Univ. Chile cxxi. 832 (1908) and Fl. Chile v. 237 (1910).

CHILE: Isla San Ambrosia, Aug. 1869, *Simpson* (MS, TYPE; G, photo.); Isla San Ambrosia, Sept. 1874, *Vidal* (MS; G. photo.).

A very peculiar insular monotype evidently derived from *Cryptantha* and characterized by its peculiar calyx and corolla-structures. The calyx is decidedly cylindrical, very broadly, obliquely and firmly attached, and bears on the abaxial side above the base an elongate appendage. This appendage is evidently the floral bract that has become decurrent upon and fused with the lower part of the calyx. The corolla-tube below the middle on its inner surface is provided with 5 pairs of knife-like lamellae which are apparently similar in origin to the minute scales frequently present at the base of the corolla-tube in *Cryptantha* and other genera. These unusual developments, the floral bracts decurrent on the calyx and the unusually large appendages of the corolla-tube, separate the proposed genus, not only from *Cryptantha*, but from practically all other genera of the subfamily.

Nesocaryum is a derivative of the section *Krynitzkia* of *Cryptantha* and probably from a member of the series *Barbigerae*. The fruit is indistinguishable from *Cryptantha* and quite like that of the large-flowered South American species of the series mentioned.

11. **Plagiobothrys** F. & M.

Calyx cut almost to base into lanceolate or oblong erect or connivent lobes. Corolla with a short tube at most barely surpassing the calyx;

lobes spreading, imbricate, rounded; throat with intruded appendages. Style slender, usually short; stigma capitate. Ovules 4. Nutlets usually 4, erect, ovate to lanceolate, smooth or roughened; areola basal to medial, at lower end of the strong ventral keel or rarely terminating a stipitate prolongation of it, plane or excavated, simple or caruncu-late. Gynobase low-convex or pyramidal or frustate.—Annual or perennial herb. Leaves with at least the lowermost pair opposite but sometimes obscurely so from a rosulate basal arrangement, leaves linear to oblong. Flowers white, in bracted or naked racemes.—Ind. Sem. Hort. Petrop. ii. 46 (1835). *Echidiocarya* Gray, Proc. Am. Acad. xi. 89 (1876). *Allocarya* Greene, Pittonia i. 12 (1887). *Sonnea* Greene, Pittonia i. 22 (1887). *Echinoglochin* Brand in Fedde, Repert. xxi. 252 (1925).

A difficult genus of about 60 species. Except for two outlying species, one in Australia and another in Kamchatka, the group is American, reaching its greatest development in western United States and Chile.

Key to Species.

Lower leaves crowded to form a rosette and their opposite arrangement obscured. § *Euplagiobothrys.*

Racemes bractless; nutlets 2.5–3 mm. long, with an excavated annulate carunculate scar; plant 1.5–5 dm. tall, dye-stained only on root and on midribs and bases of lower leaves ..... 1. *P. fulvus.*

Racemes bracted; nutlets 1–2 mm. long, with solid scar; plant 0.5–2 dm. tall, dye-stained throughout.

Plant prostrate or spreading; nutlets 1.3–2 mm. long, with low rounded ridges; Argentina and Chile .... 2. *P. verrucosus.*

Plant erect or strictly ascending; nutlets 1–1.5 mm. long, with sharp well developed ridges or papillae; Chile and Peru ..... 3. *P. tinctorius.*

Lower leaves not crowded to form a rosette, loose, with the lowermost evidently opposite.

Ventral keel drawn out below the middle into a short stipe bearing the areola. § *Echidiocarya* ..... 4. *P. collinus.*

Ventral keel not at all drawn out into a stipe, the areola sessile. § *Allocarya.*

Corolla much surpassed by calyx; plant ca. 5 cm. tall; leaves filiform, 0.5–2 cm. long, 1 mm. broad; calyx cylindrical, subsessile, strict, 2.7–3 mm. long; a very poorly understood species of central Chile ..... 5. *P. armeriifolius.*

Corolla at length equalling and usually clearly surpassing the calyx.

Plant perennial, mostly of high altitudes.

Plants densely strigose; stems ascending; southern Chile.

Stems with only a single pair of opposite leaves; leaves 2–5 cm. long, 1–2.5 mm. broad ..... 6. *P. Germaini.*

Stems with 4–6 pairs of opposite leaves; leaves 1–2.5 cm. long, 0.6–1 mm. broad ..... 7. *P. foliosus.*

Plants sparsely villous or glabrescent; stems prostrate or long-trailing; northern Argentina to Colombia.
Style very much surpassing the mature fruit; flowers in axils of cauline leaves or in subacaulescent forms from a leafy tuft and seemingly scapose; corolla 4–6 mm. broad; pedicels 3–6 mm. long, slender; Lake Titicaca Region.....8. *P. Kunthii.*
Style short. shorter than or at most reaching to the tips of the nutlets.
Flowers racemose, in axils of alternately disposed bracts; Peru, Bolivia and northern Argentina.
Tips of calyx-lobes darkly tawny; racemes usually elongate and loose; foliage very sparsely strigose or glabrescent.....9. *P. humilis.*
Tips of calyx-lobes at most pale straw-colored; racemes usually glomerate; foliage cinerescent, hispid-villous.....10. *P. congestus.*
Flowers solitary in the axils of the opposite cauline leaves; Ecuador and Colombia.
Corolla 2.5–3.3 mm. broad; mature calyx with short obscure pedicels 0.3–0.9 mm. long; leaves narrowly oblance-linear, 0.8–1.5 cm. long, 0.8–1.1 mm. broad.....11. *P. pygmaeus.*
Corolla 4–6 mm. broad; mature calyx with evident pedicels 1–1.5 mm. long; leaves narrowly oblanceolate or linear-oblanceolate, 1–2.5 cm. long, 1.5–3 mm. broad.....12. *P. linifolius.*
Plant annual, mostly from low altitudes.
Corolla inconspicuous or small, 1–3 mm. broad.
Nutlets not rugose, merely tuberculate or papillate; scar large, concave or somewhat excavated; Peru.....13. *P. Macbridei.*
Nutlets always somewhat transversely rugose, frequently also more or less tuberculate or papillate; Chile.
Nutlets with an excavated or decidedly concave scar, reticulate-rugose, all somewhat tuberculate or papillate or subulate-appendaged or commonly only the more or less heteromorphous axial one so, appendages frequently glochidiate.....14. *P. procumbens.*
Nutlets with a solid scar, not papillate or subulate-appendaged, definitely homomorphous; appendages never glochidiate.
Nutlets narrowly reticulate-rugose, ovate, ca. 1 mm. long.....15. *P. polycaulis.*
Nutlets broadly transverse-rugose, usually narrowly ovate, 1.5–2.3 mm. long.
Nutlets decidedly compressed, with a convex or very broadly (obtuse-)angled anterior face.....16. *P. calandrinioides.*
Nutlets weakly compressed, with a prominently (right-)angled anterior face.
17. *P. oppositifolius.*
Corolla evident to large, (3–)4–6 mm. broad.
Nutlets sparsely but prominently papillate, transverse rugae obscure or none.....18. *P. pulchellus.*

Nutlets reticulate-rugose.
Reticulate ridging of nutlets prominent and narrow.....19. *P. uliginosus.*
Reticulate ridging of nutlets low and broad.
Lower pedicels elongating, very slender, 4–8 mm. long.....20. *P. pedicellaris.*
Lower pedicels, 0.5–3 mm. long.
Herbage sparsely and inconspicuously strigose; style surpassing the nutlets..21. *P. corymbosus*
Herbage densely strigose; style reaching to the tips of the nutlets.....22. *P. pratensis.*

1. **Plagiobothrys fulvus** (H. & A.) Johnston. Annual, 1.5–4 dm. tall, short-villous, with one or rarely two erect simple or sparsely and ascendingly short-branched stems; root and midribs of lower leaves stained with a purple dye; basal leaves in a rosette, oblanceolate, 2–12 cm. long, 5–10 mm. broad; cauline leaves scattered, alternate, lance-oblong to linear; racemes bractless, solitary to ternate, 5–20 cm. long, becoming very loosely flowered; calyx tawny at first, divided almost to base into lanceolate ascending lobes, at maturity 3–5 mm. long; pedicels 1–1.5 mm. long; corolla white, tube equalling or very slightly surpassing the calyx, lobes ascending, limb 1.5–3 mm. broad; nutlets 4, 2.5–3 mm. long, 1.5–2 mm. broad, pale, gray, densely granulate or granulate-muriculate, with a sharp medial dorsal keel and margins, also with less prominent transverse ridges which are frequently broken up into rows of papillae or murications; caruncular areola inframedial, annular, much below the crest of the very sharp ventral keel.—Contr. Gray Herb. lxviii. 70 (1923). *Myosotis fulva* H. & A. Bot. Beechey Voy. 38 (1830). *Eritrichium fulvum* A. DC. Prodr. x. 132 (1846); Clos in Gay, Fl. Chile iv. 465 (1849). *M. alba* Colla, Mem. Acad. Torino xxxviii. 128, t. 41 (1834). *P. rufescens* F. & M. Ind. Sem. Hort. Petrop. ii. 46 (1835 or 1836); A. DC. Prodr. x. 134 (1846); Clos in Gay, Fl. Chile iv. 474 (1849); Gray, Proc. Am. Acad. xx. 282 (1885); Reiche, Anal. Univ. Chile cxxi. 811 (1908) and Fl. Chile v. 216 (1910). *E. asperum* Ph. Anal. Univ. Chile xliii. 516 (1873); not *E. asperum* Ph. Linnaea xxix. 16 (1857) which is a *Cryptantha*. *E. fulvum*, var. *pinguis* Ph. Anal. Univ. Chile xliii, 518 (1873). *E. laxiflorum* Ph. Anal. Univ. Chile xc. 527 (1895). *P. rufescens*, var. *laxiflorus* Reiche, Anal. Univ. Chile cxxi. 812 (1908) and Fl. Chile v. 217 (1910).

CHILE. VALDIVIA: Pampa de Negron, March, 1864, *Krause* (MS, TYPE of *E. asperum*). MALLECO: Collipulli, 1915, *Baeza* (IP). BIO-BIO: Almendes, Araucania, 1889, *Philippi* (MS). ÑUBLE: Chillan, 1866, *Ant. de Solis* (MS); near Chillan, Oct. 1878, *Puga* (MS). TALCA: Talca, Oct. 1921, *Claude-Joseph 1651* (US). SANTIAGO: San Cristobal, Sept. 16, 1881, *collector not given* (MS); San Cristoral, Sept. 1879, *no collector given* (MS); San Cristobal

near Santiago, Nov. 3, 1900, *Hastings 113* (NY, US); Santiago, Oct. 1918, *Claude-Joseph 551* (US); "Colina, Renca, etc.," 1871, *no collector given* (MS, TYPE of *E. rufescens*, v. *pinguis;* G, photo.); Cerro de Renca, Sept. 1876, *no collector given* (MS); Renca, Sept. 30, 1887, *no collector given* (MS); Nuñoa, Nov. 1920, *Claude-Joseph 1302* (US); Hacienda Mercedes, Oct. 6, 1888, *no collector given* (MS, TYPE of *E. laxiflorum;* G, photo.); Santa Rita, Sept. 12, 1879, *no collector given* (MS); Prov. Santiago, Sept. 1830, *Gay 1627* (MS); San Bernardo, 1923, *Baeza* (IP). VALPARAISO: Valparaiso, Oct. 1925, *Claude-Joseph 3640* (US); Valparaiso, April, 1895, *Buchtien* (US). ACONCAGUA: Zapallar, 1909, *Johow* (IP). INDEFINITE: Porcillos, *no collector given* (MS); Chile, *Gay 300* (NY); Chile, *Gay* (G); moist sandy open places, "Quillota, Rancagua," 1835, *Bertero 445* and *1156* (G, NY).

This species has an extremely close relative in California. It differs from the North American plant only in being more slender and generally a little smaller in all its parts and in having the calyx somewhat less darkly tawny. Because of these differences I feel that the Californian form is worthy of a varietal name; certainly it is not specifically distinct. In accordance with these views the correct name of the form in California is, *P. fulvus*, var. *campestris* (Greene) Johnston, Contr. Gray Herb. lxviii. 70 (1923).

2. **P. verrucosus** (Ph.), comb. nov. Prostrate or loosely ascending 15–25 cm. broad, dye-stained throughout; stems spreading, one to several, branches ascending; basal leaves in a loose rosette, some of them evidently opposite, oblanceolate, 2–3 cm. long, 4–5 mm. broad; cauline leaves oblong or linear-oblong, obtuse; racemes leafy-bracted, solitary or geminate, 5–8 cm. long; calyx divided almost to base into erect or loosely connivent lanceolate lobes, at maturity 2–2.5 mm. long; pedicels ca. 1 mm. long; corolla white, shortly surpassing the calyx, 1–2 mm. long; nutlets broadly ovate, 1.3–2 mm. long, rounded at base, constricted just below apex, sparsely and obscurely granulate, medial dorsal keel low and rounded or rarely narrow, the transverse ridges occasionally narrow and definite but usually rounded and obscure; caruncular scar inframedial, in a shallow transverse ventral groove evidently below the crest of the well developed ventral keel.—*Eritrichum verrucosum* Ph. Linnaea xxix. 17 (1857). *P. patagonicus* Johnston, Contr. Gray Herb. lxviii. 76 (1923).

CHILE. LINARES: Cordillera de Linares, Jan. 1856, *Germain* (MS, TYPE of *E. verrucosum;* G. photo.).

ARGENTINA. RIO NEGRO: San Carlos de Bariloche, 800 m. alt., *Buchtien 118* (G, US). CHABUT: arid places near Lago Paz, Feb. 1900, *Spegazzini* (G); Colonia 16 de Octubre, Feb. 1926, *Guinazú 7344* (G). SANTA CRUZ: Patagonia, lat. 50°-53°, *Moreno & Tonini 530* (NY, TYPE of *P. patagonicus*).

In gross aspect much suggesting the Californian, *P. Torreyi*, var. *diffusus* Johnston, but differing from it in details and particularly in the marking of the nutlets. The nutlets of the Californian plant have

the back broken up into low-convex areas separated by several pairs of transverse lineate grooves. *Plagiobothrys verrucosus* is most related to *P. tinctorius*, but differs in being somewhat coarser and prostrate, and in having nutlets which average larger and have low and rounded rather than sharp and prominent ridges. The species has a basal rosette much looser than in other species of the section *Euplagiobothrys*, the opposite arrangement of the rosette-leaves being usually readily discernable. The type of *E. verrucosum* is not characteristic of the species. It consists of a very slender (possibly erect) plant, ca. 10 cm. long, which has a single branch ca. 8 cm. long. It is in mature fruiting condition. The nutlets are ca. 2 mm. long and are very obscurely roughened. The type is clearly not referable to *P. tinctorius*.

3. **P. tinctorius** (R. & P.) Gray. Plant erect, 5–20 cm. tall, dye-stained throughout; stems slender, one to several, branched, strictly ascending; basal leaves in a more or less persistent rosette, oblong-linear to linear-oblanceolate, 1–4 cm. long, 1–4 mm. broad, obtusish; cauline leaves oblong to lance-oblong or linear, alternate; racemes solitary or geminate, becoming loosely flowered, 2–10 cm. long, leafy-bracted at least below; calyx slightly tawny, divided almost to base into erect or loosely connivent lanceolate lobes, at maturity 1.5–2.5 mm. long; corolla white, limb 1–2.5 mm. broad, tube shortly surpassing the calyx; nutlets broadly ovate, 1–1.5 mm. long, rounded at base, constricted below apex, granulate, always with a strong medial dorsal keel and rather well developed lateral crests, roughened by sharp parallel sometimes reticulate ridges or commonly also by papillae or murications which are scattered or arranged in a reticulate or parallel manner; caruncular scar inframedial, seated in the broad transverse ventral groove a little beneath the level of the well developed ventral keel.—Proc. Am. Acad. xx. 283 (1885); Reiche, Anal. Univ. Chile cxxi. 811 (1908) and Fl. Chile v. 216 (1910); Johnston, Contr. Gray Herb. lxviii. 71 (1923). *Lithospermum tinctorium* R. & P. Fl. Peruv. ii. 4, t. 114 (1799). *Eritrichium tinctorium* A. DC. Prodr. x. 132 (1846); Clos in Gay Fl. Chile iv. 469 (1849). *L. myosotoides* Lehm. Asperif. ii. 319 (1818). *L. tingens* R. & S. Syst. iv. 44 (1819). *E. Pugae* Ph. Anal. Univ. Chile xc. 532 (1895).

PERU. Arequipa: Volcan El Chachani, ca. 4000 m. alt., April 1895, *Bailey* (G); gravelly places on open rocky slopes, 3700–4000 m. alt., Nevada de El Chachani, *Pennell 13279* (G, FM).

CHILE. Malleco: margin Rio Renaico, Esperanza, 1915, *Baeza* (IP). Bio-Bio: between Nacimiento and Angol, Jan. 1877, *no collector given* (MS). Concepcion: St. Vicente, 1890, *no collector given* (MS). Ñuble: between Bollen and Coihueco, Oct. 1878, *Puga* (MS, type of *E. Pugae;* G, photo.).

MAULE: San José, 1861–62, *Volckmann* (MS). TALCA: Talca, Oct. 1921, *Claude-Joseph 1683* (US). COLCHAGUA: San Fernando, Sept. 1864, *no. collector given* (MS). OHIGGINS: Rancagua, Sept. 8, 1879, *Gay* (MS); Rancagua, Oct. 1828, *Bertero 442* (G, NY). SANTIAGO: Santiago, Sept. 15, 1921, *Claude-Joseph 1363* (US); San Cristoral, Sept. 4, 1879, *no collector given* (MS); "colibus" San Christoral, Sept. 1840, *Gay 1618* (MS); San Cristobal, Aug. 8, 1876, *no collector given* (MS); Cerro San Cristobal, Nov. 10, 1923, *Looser* (Looser Herb.; G); Santa Rita, Sept. 12, 1879, *no collector given* (MS); San Bernardo, 1923, *Baeza* (IP); Cordillera de la Dehesa, Nov. 1861, *no collector given* (MS); Curacari, Sept. 1853, *no collector given* (MS); Tiltil, 1911, *Horst* (IP); Chacabuco, Sept. 1864, *no collector given* (MS). VALPARAISO: Quillota, Oct. 1829, *Bertero 1160* (NY); Valparaiso, 1909, *Rudolph* (IP). ACONCAGUA: Catemu, Sept. 1860, *no collector given* (MS). INDEFINITE: Maeul, 1917, *Baeza* (IP); Chile, *Gay* (G, NY); Chile, *Bridges 314* (G).

This readily recognized plant of south-central Chile apparently must be accredited to southern Peru. The two collections from the volcano, El Chachani, above Arequipa, seem quite the same as the far removed plant of central Chile. *Plagiobothrys tinctorius* is related to the North American *P. Torreyi* Gray, and *P. tenellus* (Nutt.) Gray, though clearly distinct from both.

4. **P. collinus** (Ph.), comb. nov. Stems several, ascending to strictly ascending, 3–15 cm. long, branched, usually appressed-villous or hispid-villous; leaves linear to oblance-linear, obtusish, 1–3 cm. long, 2–4 mm. broad, the lowermost clearly opposite; racemes 2–5 cm. long, bracted at base; calyx 1.5–2.5 mm. long, parted into connivent lanceolate lobes, fulvescent, subsessile; corolla inconspicuous, 1–1.5 mm. broad; nutlets obliquely ovoid, 1.2–1.5 mm. long, acute, reticulate-rugose with strong sharp ridges, the ventral keel well developed and towards base of nutlet drawn out into a short thick stipe bearing the areola; style about equalling the nutlets in length.—*Eritrichum collinum* Ph. Linnaea xxix. 17 (1857). *Cryptantha collina* Reiche, Anal. Univ. Chile cxxi. 828 (1908) and Fl. Chile v. 233 (1910). *E. inconspicuum* Ph. Anal. Univ. Chile xc. 534 (1895). *C. inconspicua* Reiche, Anal. Univ. Chile cxxi. 820 (1908) and Fl. Chile v. 225 (1910).

CHILE. COQUIMBO: La Serena, Oct. 1878, *Philippi* (MS, TYPE of *E. inconspicuum;* G, photo.); Coquimbo, Sept. 1885, *Philippi* (MS; G, photo.); hills, Huanta, Aug. 1836, *Gay 1623* (MS, TYPE of *E. collinum;* G, photo.).

A very close relative of *P. californicus* (Gray) Greene, of southern California and adjacent Mexico and perhaps conspecific with it. The Chilean plant is closest to *P. californicus*, var. *gracilis* Johnston, and var. *fulvescens* Johnston, cf. Contr. Gray Herb. lxviii. 73 (1923), but differs from both in its apparently erect habit and more prominently rugose nutlets. In size and shape of nutlets, in leaf-form, in inflorescence and in form and size of the calyx it is closest to the var. *fulvescens*

though differing conspicuously from it in having softer pubescence. The relationship between the Californian and Chilean plants is very clear and strong, so incontravertable in fact, that some changes in the classification of the North American forms will probably be made.

5. **P. armeriifolius** (Ph.), comb. nov. Annual, 5.5 cm. tall, erect, short appressed pallid hirsute-villous throughout, herbaceous, from above base producing numerous short strict leafy branches; leaves filiform-linear, strict, 0.5–2 cm. long, 0.8–1 mm. broad; racemes slender, densely flowered, 1–1.5 cm. long, geminate, ascending, sparsely leafy-bracted; calyx (before anthesis) very elongate, 2.7–3 mm. long, ca. 0.8 mm. thick, strict, divided, the very narrowly linear lobes erect, base abruptly contracted and subsessile; corolla (not quite mature) with tube reaching about $\frac{2}{5}$ height of calyx, the narrow (probably ascending) lobes reaching to about $\frac{2}{3}$ height of calyx, at anthesis the corolla probably distinctly surpassed by the calyx-lobes; fruiting structures unknown.—*Eritrichium armeriifolium* Ph. Anal. Univ. Chile xc. 551 (1895).

CHILE. Colchagua: San Fernando, Sept. 1864, *Philippi* (MS, type; G, photo.).

A curious plant known only from the type specimen which consists of a single small plant, broken off at ground, lacking fruit, and with the flowers only in well developed bud. It was originally described as biennial or perennial and as hard and woody at the base, but that I believe to be incorrect. The plant appears to be an annual which grew in dryish soil. The lower part is no more hard and woody than are similar parts in any of the common annual species of the section *Allocarya*. I am quite unable to detect any close relationships for *P. armeriifolius*. Perhaps it is only a freak or extreme ecological form of some well-known species with its identity further masked by its immaturity. More collections of this strange and puzzling plant are greatly desired.

6. **P. Germaini** (Ph.), comb. nov. Perennial from a cluster of thickened roots; stems usually several, decumbent or ascending, 5–15 cm. long, closely and densely fine-strigose; leaves numerous, very elongate, linear, 2–5 cm. long, 1–2.5 mm. broad, strigose, mostly basal and crowded, those of the stem few, usually the lowest pair opposite; racemes bractless or very sparsely bracted, tending to become loosely flowered at maturity; mature calyx 3–4 mm. long, base conical and tapering to a pedicel ca. 1 mm. long, lobes strict and densely fulvescent-strigose; corolla 3–7 mm. broad, white; nutlets ovate with a rounded base and acute apex, 1.2–1.5 mm. long, granulate, with a

definite dorsal keel and strong loosely reticulate lateral ridges at least above the middle, below the middle the medial keel and lateral ridges weak or broken up into papillae or murications, scar suprabasal; gynobase pyramidal; style equalling or much surpassing the nutlets.—*Eritrichium Germaini* Ph. Anal. Univ. Chile xc. 550 (1895). *Allocarya Germaini* Reiche, Anal. Univ. Chile cxxi. 808 (1908) and Fl. Chile v. 214 (1910).

CHILE. Malleco: San Ignacio de Pemehue, Cordillera fronting Victoria, 1894–95, *Germain* (MS, type; G, photo.); Victoria, 1913, *Baeza* (IP); Victoria, 1914, *Stuardo* (IP).

A remarkably distinct species of uncertain relationship.

7. **P. foliosus**, sp. nov. Perennis dense canescenti-strigulosus; caulibus numerosis gracilibus foliosis laxe decumbentibus 6–12 cm. longis e radice gracili verticali orientibus, internodiis saepissime 5–12 mm. longis; foliis numerosis linearibus 1–2.5 cm. longis 0.6–1 mm latis omnibus (supremis solis exceptis) oppositis; racemis solitariis vel geminatis ebracteatis 2–5 cm. longis; calycibus maturitate strictis, lobis linearibus erectis obtusis ca. 3.5 mm. longis, pedicellis 0.7–1.2 mm. longis; corolla conspicua alba cum limbo 4–6 mm. lato; nuculis ovatis 1.3–1.5 mm. longis irregulariter rugosis carinatis; areola suprabasali obliqua parva; stylo nuculas paullo superante.

CHILE. Ñuble: Yungay, Feb. 20, 1916, *Stuardo* (IP, type; G, frag.).

A very well marked species perhaps most related to *P. Germaini* from which it differs in its leafy stems, slender root, and shorter and narrower opposite leaves.

8. **P. Kunthii** (Walp.) Johnston. Perennial, matted, acaulescent or with stout repent stems, roots fasciculate at nodes; leaves narrowly linear, obtusish, 1–2.5 cm. long, 0.7–1 mm. broad, in a loose basal tuft or clearly opposite along the stem, appressedly and sparsely hispid-villous, margins sparsely ciliate, base dilated and papery; flowers solitary and axillary, in caulescent states in the axils of opposite cauline leaves but in stemless ones springing from the basal tuft of leaves and apparently scapose; calyx cylindrical, sparsely short-villous, base at first narrowly conical but in fruit broad and rounded; calyx-lobes linear or oblance-linear, erect or spreading, becoming 2–4 mm. long; pedicels 3–6 mm. long, becoming stout, usually erect; corolla white with yellowish appendages, limb 4–6 mm. broad, tube 3–3.5 mm. long and 1–1.4 mm. thick; nutlets ovate with a rounded base and acute apex, 1.4–1.8 mm. long, coarsely reticulate-rugose at least above the middle, frequently spiculate on the ridges, medial keel definite only towards the apex, areola suprabasal; style extremely long,

much surpassing the nutlets.—Contr. Gray Herb. lxviii. 74 (1923). *Anchusa Kunthii* Walp. Nov. Act. Acad. Caes. Leop. Nat. Cur. xix. suppl. 372 (1843). *Allocarya linifolia*, var. *Kunthii* Macbr. Proc. Am. Acad. li. 545 (1916). *Antiphytum Walpersii* A. DC. Prodr. x. 122 (1846). *Eritrichium Walpersii* Wedd. Chlor. Andina ii. 90 (1859).

PERU. Puno: low pampa on shore of Lake Titicaca, Puno, Oct. 12, 1919, *Shepard 4* (G).

BOLIVIA. La Paz: margin of Laguna de Pachaujo, between Laripata and Ticonguaya near Sorata, 4300 m. alt., Sept. 1858, *Mandon 383* (NY); wet places, Omasuyos near Achacache, 3950 m. alt., Dec. 1857–April 1858, *Mandon 382* (NY); old lake-bed, Pocoata, Feb. 12, 1903, *Hill 337* (Kew).

This species is known only from the vicinity of Lake Titicaca. It is readily recognized by its very long style and by its large, evidently pedicellate flowers. The original description of *A. Kunthii* is extremely brief. Since I have seen no authentic material it is possible that I may have the species incorrectly interpreted. However the very distinct species here treated is the only one I know from the Titicaca region with solitary subterminal axillary flowers, as called for in Walpers's short diagnosis, and so is very probably the species he described. The species as treated here somewhat suggests *P. congestus* in habit and in pubescence but is probably most related to *P. pygmaeus* and *P. linifolius*, particularly to the former. I doubtfully refer to the species a plant collected by Hill (no. 336, Kew) in a damp place near Guaqui at the south end of Lake Titicaca. This plant is glabrescent and has well developed very slender stems, although in other characters it is like the plants I have unconditionally referred to *P. Kunthii*.

9. **P. humilis** (R. & P.) Johnston. Repent perennial from a taproot; stems prostrate or frequently with the tips ascending, usually rooted at some of the nodes, glabrescent or sparsely strigose; leaves numerous, all opposite, linear with a rounded apex, 2–6(–11) cm. long, 1.5–3 mm. broad, sparsely strigose to merely ciliate, glabrescent, bases papery and dilated; racemes 2–9 cm. long, usually equalling or surpassing the subtending leaves, becoming very loosely flowered and somewhat pedunculate, interruptedly bracted; bracts alternately arranged, 0.5–2(–3) cm. long; calyx appressed-villulose, canescent with tawny tips, at maturity 2.5–3.5 mm. long, base rounded, pedicels 0.5–1 mm. long, lobes lanceolate and erect; corolla white, limb 1–2 mm. broad; nutlets ovate with a rounded base and acute apex, 1–1.5 mm. long, granulate, irregularly and loosely reticulate-ridged, with a definite medial dorsal keel only above the middle, scar suprabasal; style surpassed by nutlets or at most equalling them.—Contr. Gray Herb.

lxviii. 75 (1923). *Myosotis humilis* R. & P. Fl. Peruv. ii. 5 (1799); Lehm. Asperif. i. 108 (1818). *Eritrichium humile* A. DC. Prodr. x. 133 (1846); Clos in Gay, Fl. Chile iv. 471 (1849); Wedd. Chlor. Andina ii. 88 (1859). *Allocarya humilis* Greene, Pittonia i. 17 (1887). *Cynoglossospermum humile* Kuntze, Rev. Gen. iii. pt. 2, 204 (1898).

PERU. Ancash: dryish brook-bed, Catuc, ca. 24 km. east of Huaraz, 3150 m. alt., Oct. 1922, *Macbride & Featherstone 2510* (G, FM). Junin: marshy places in pasture, La Quinua, 3600 m. alt., May 1922, *Macbride & Featherstone 2013* (G, FM). Lima: wet or desiccated places on slope, Cerro Colorado near Antaicocha east of Canta, 3300–3800 m. alt., June 1925, *Pennell 14640* (G, FM); muddy brook-margin, Matucana, 2400 m. alt., April–May 1922, *Macbride & Featherstone 459* (G, FM); near Chicla, 3600–3900 m. alt., April 1882, *Ball* (G, NY); Baños, *Wilkes Exped.* (G, NY). Cusco: moist slopes, La Raya, 4300–4500 m. alt., April 1925, *Pennell 13504* (G, FM). Moquegua: Carumas near Volcano Ticsani, 4000 m. alt., Feb. 1925, *Weberbauer 7325a* (G, FM).

BOLIVIA. La Paz: marshy places, La Paz, 3750 m. alt., Jan. 28, 1919, *Buchtien 43* (FM); near Jungas, 1200 m. alt., *Rusby 2581* (NY); Unduavi, 3300 m. alt., Nov. 1910, *Buchtien 4682* (US); Chacambaya near Quiabaya, 3000 m. alt., *Mandon 380* (NY); near Rio Mulluponcu between Laripata and Tani, 3000–3100 m. alt., *Mandon 379* (G, NY). Indefinite: Bolivia, *Bang 1908* (G, NY); Bolivia, *Bang 1962* (G, NY, FM).

The type of *Myosotis humilis* R. & P. came from Pillao, a locality about 50 km. northeast of Huánuco, Peru. It is described as a hispid annual. As I have seen no authentic material I feel it best to follow usage, largely traceable to Weddell's Chloris Andina, and accept the name at least tentatively for the widely distributed Peruvian perennial above described. The plant treated here is most related to *P. congestus* but is readily separated by its coarser looser habit, sparser pubescence and tawny calyx-lobes. It is usually very quickly recognized merely by an examination of the calyx which is very characteristic in having the lobes very tawny at the tips. The species assumes a dwarfed condition exemplified by *Buchtien 4682, Pennell 13504, Weberbauer 7325a* and *Macbride & Featherstone 2510*, in which the racemes are glomerate and partially concealed by a tuft of leaves. Weddell probably included such forms in his var. *congestum* along with the plant which I have treated as *P. congestus*. These dwarfs forms of *P. humilis* are quickly distinguished from *P. congestus* by the very sparsely pubescent or glabrescent leaves and, of course, tawny calyx-lobes.

10. **P. congestus** (Wedd.) Johnston. Perennial from a taproot, repent; stems decidedly prostrate, rooting at the nodes, much branched, sparsely villous or glabrescent; leaves numerous, all opposite, linear to oblance-linear, 6–20 but commonly 10–15 mm. long, 1–2 mm. broad, somewhat cinerescent, appressed hispid-villous, apex rounded,

with somewhat dilated papery ciliate bases; racemes usually glomerate in the upper axils and commonly surpassed by the adjacent leaves, frequently elongating and becoming 1–2(–3) cm. long, leafy-bracted throughout, the bracts 5–10 mm. long and alternate; calyx appressed-villulose, cinerescent or very slightly flavescent, at maturity 2.5–3 mm. long, base rounded, pedicels 0.5–1 mm. long; calyx-lobes linear or linear-lanceolate, erect; corolla white, limb 1–2.3 mm. broad; nutlets ovate with a rounded base and acute apex, 0.9–1.2 mm. long, granulate, irregularly and loosely ridged, with the medial dorsal keel definite only above the middle, scar suprabasal; style equalling the height of the nutlets or definitely surpassed by them.—Contr. Gray Herb. lxviii. 75 (1923). *Eritrichium humile*, var. *congestum* Wedd. Chlor. Andina ii. 88 (1859).

PERU. Puno: Chuquibambilla, gravelly banks of riverlet on puna, 3850–3900 m. alt., April 1925, *Pennell 13397* (G, FM); Occa Pampa, Prov. Huancané, 3700 m. alt., Dec. 1919, *Shepard 107* (G, NY, US). Moquegua: Carumas near Volcano Ticsani, 4000 m. alt., Feb. 1925, *Weberbauer 7325* (G, FM).

BOLIVIA. La Paz: on puna, La Paz, 4100 m. alt., Feb. 1910, *Buchtien 43* (G, US, FM); on puna, La Paz, 4100 m. alt., Jan. 25, 1907, *Buchtien 43* (US); Chuquiaquillo near La Paz, April 1857, *Mandon 381* (G); Omapusa near Achacache, 4000 m. alt., Jan.–March 1859, *Mandon 381* (NY); Copacabana, Jan. 24, 1903, *Hill 330* (Kew). Oruro: between Oruro and Cochabamba, 4000 m. alt., March 17, 1892, *Kuntze* (NY). Tarija: Escayache near Tarija, 3600 m. alt., Jan. 30, 1904, *Fiebrig 3019* (G, US).

ARGENTINA. Tucaman: La Cienega, Sierra de Tucaman, Jan. 1874, *Lorentz & Hieronymus 639* (US, FM).

This species is very closely related to *P. humilis*, but has a more southerly distribution and is smaller and more slender throughout. Its foliage is rather persistently pubescent and cinereous, the racemes are more or less glomerate and the calyx-lobes are not noticeably tawny at the tips. As originally treated by Weddell the present plant was apparently confused with the dwarf states of *P. humilis*. The original description, however, calls for plants differing from *P. humilis* in having congested racemes and stems with more numerous and much shorter branches. This applies completely to the plant here treated as *P. congestus*.

It seems not improbable that the collections of Meyen treated by Walpers, Nov. Act. Acad. Caes. Leop. Nat. Cur. xix. suppl. 371 (1843), as *Amsinckia humifusa* also belong to the present species. However, since the specific name used by Walpers was obviously derived from one of Poeppig's herbarium-names, and since Walpers's brief description is quite ambiguous applying equally well to various species of south central Chile as to the Bolivian *P. congestus*, it seems

best to reserve Walpers's name for the Chilean species including Poeppig's collection number 55 which is cited by Walpers. Just what this species is I am not certain. DeCandolle, Prodr. x. 133, footnote (1846), thought it might be *P. procumbens*.

11. **P. pygmaeus** (HBK.) Johnston. Perennial, repent; stems prostrate, slender, rooting at the nodes, sparsely strigose, sometimes loosely branched but more often densely so and congested, internodes usually short; leaves narrowly oblance-linear, 0.8–1.5 cm. long, 0.8–1.2 mm. broad, all opposite, very sparsely hispid-strigose and frequently so only on the margins, apex obtuse, gradually contracted towards the narrowly connate expanded papery base; flowers solitary in the axils of the opposite cauline leaves, subsessile and strict; calyx sparsely appressed-villous, with erect or loosely spreading lanceolate lobes becoming 2–3 mm. long, subsessile or with very short obscure pedicels 0.3–0.9 mm. long; corolla white, limb 2.5–3.3 mm. broad, tube 1–1.4 mm. long and 0.8 mm. thick; nutlets ovate, with a rounded base and acute apex, 1.2–1.6 mm. long, roughened with rounded irregularly reticulate ridges which are frequently obscure or absent below the middle, medial dorsal keel definite only towards the apex, areola suprabasal; style decidedly shorter than the nutlets.—Contr. Gray Herb. lxviii. 74 (1923). *Anchusa pygmaea* HBK. Nov. Gen. et Sp. iii. 92 (1818). *Eritrichium pygmaeum* Wedd. Chlor. Andina ii. 89 (1859). *Lithospermum alpinum* R. & S. Syst. iv. 742 (1819).

ECUADOR. Loja: Chuquiribamba, Nov. 16, 1876, *André 4442* (G, FM). Azuay: vicinity of Cumbre, Sept. 24, 1918, *Rose, Pachano & Rose 22947* (G, NY). Indefinite: Ecuadorian Andes, *Spruce 5309* (G).

The type of this species was collected at 4100 m. alt. near the summit of Antisana, Prov. Pichincha, Ecuador. It is probably most related to *P. linifolius* but is smaller in all parts and is more slender and more compact in habit.

12. **P. linifolius** (Lehm.) Johnston. Perennial; stems trailing, rooting at the nodes, slender with the internodes usually equalling or surpassing the leaves in length, very loosely branched, not congested into a mat; leaves narrowly oblanceolate or linear-oblanceolate, 1–2.5 cm. long, 1.5–3 mm. broad, all opposite, acute, very sparsely hispid-strigose, usually somewhat ciliate with strict hairs, noticeably contracted towards the dilated papery narrowly connate base; flowers solitary in the axils of the opposite cauline leaves; calyx sparsely appressed-villous, with erect or spreading lance-linear lobes, becoming 2.5–4 mm. long; pedicels becoming evident, 1–1.5 mm. long, spreading; corolla white, 4–6 mm. broad, tube 2–2.3 mm. long and 1.2–1.3 mm.

thick; nutlets ovate with a rounded base and acute apex, 1.5–1.9 mm. long, roughened with rounded irregularly reticulate ridges which occasionally are obscure below the middle, medial dorsal keel usually definite only towards the apex, areola suprabasal; style shorter than the nutlets.—Johnston, Contr. Gray Herb. lxviii. 74 (1923). *Anchusa linifolia* Lehm. Asperif. i. 215 (1818). *Antiphytum linifolium* DC. Prodr. x. 121 (1846). *Eritrichium linifolium* Wedd. Chlor. ii. 89 (1859). *Krynitzkia linifolia* Gray, Proc. Am. Acad. xx. 266 (1885). *Allocarya linifolia* Macbr. Proc. Am. Acad. li. 545 (1916). *Anchusa oppositifolia* HBK. Nov. Gen. et Sp. iii. 91, t. 200 (1818).

ECUADOR. INDEFINITE: Quitensian Andes, 1855, *Couthouy* (G).
COLOMBIA. NARIÑO: Meneses, April 29, 1876, *André 2906* (G, NY, FM).

This species was based upon collections made in southwestern Colombia, Prov. Nariño, between Pasto and the Ecuadorean border. Weddell reports it from El Quindio apparently upon the basis of a collection by Triana. Though certainly distinct, the species seems to be most related to *P. linifolius* of Ecuador.

13. **P. Macbridei**, sp. nov. Annuus; caulibus gracilibus pluribus prostratis vel laxe ascendentibus 3–7 cm. longis adpresse breviterque villosis; foliis linearibus 2–3 cm. longis 1–2 mm. latis acutiusculis basem versus paullo dilatatis breviter sparseque hispido-villosis inferioribus oppositis; racemis laxe floratis ubique bracteatis; bracteis alternis linearibus 0.5–2 cm. longis; calycibus adpresse villosis maturitate 2–2.5 mm. longis, lobis lanceolatis erectis; corolla inconspicua subtubulari ca. 1 mm. lata; nuculis ovatis plus minusve angulatis ca. 1.5 mm. longis irregulariter tuberculatis vel papillatis obscurissime dorso carinatis; areola suprabasali grandi triangulari concava vel plus minusve excavata.

PERU. LIMA: in short grass, Viso, 2700 m. alt., May 1922, *Macbride & Featherstone 599* (FM, TYPE; G, ISOTYPE).

Clearly related to the Chilean *P. procumbens* and perhaps only a form of it. More collections of this plant are needed before its exact status can be finally decided. In lacking any transverse ridges and being merely tuberculate or papillate its nutlets are readily distinguished from those of *P. procumbens*. The size and general form of the nutlets, however, very much suggest that species as does also the large more or less excavated scar.

14. **P. procumbens** (Colla) Gray. Annual; stems usually several, prostrate or laxly ascending, strigose or appressed short hispid-villous, 5–25 cm. long, usually rebranched; leaves linear or spathulate- or

oblance-linear, 1–3.5 cm. long, 0.8–2.3 mm. broad, obtusish, lowermost opposite; racemes elongate, leafy-bracted; bracts alternate, interrupted, 1–1.5 cm. long; calyx rather densely appressed-villous, somewhat tawny, at maturity 2–4 mm. long with linear or lanceolate erect or loosely ascending lobes, shortly pedicellate; corolla inconspicuous, 1.5–2.5 mm. broad; nutlets ovate, more or less angulate, 1.3–1.7 mm. long, reticulate-rugose and granulate-tuberculate, with the roughenings prominent, frequently (especially on the somewhat heteromorphous axial one) the ridges partially or completely replaced or sometimes surmounted by murications papillae or even subulate frequently glochidiate appendages, medial dorsal keel always definite at least above the middle, margins frequently ridged and hence somewhat angulate, ventral face with a large deltoid more or less excavated suprabasal scar lying usually below the level of the well developed ventral keel; axial nutlet frequently differentiated being usually dulled with minute pubescence-like spicules and having the back more papillate and frequently provided with glochidiate appendages; style short, surpassed by the nutlets; gynobase hemispherical or pyramidal.—Proc. Am. Acad. xx. 283 (1885); Johnston, Contr. Gray Herb. lxviii. 80 (1923). *Myosotis procumbens* Colla, Mem. Acad. Torino xxxviii. 130 (1834). *Eritrichium procumbens* DC. Prodr. x. 133 (1846); Clos in Gay, Fl. Chile iv. 470 (1849); Ph. Anal. Univ. Chile xc. 543 (1895). *Allocarya procumbens* Greene, Pittonia i. 17 (1887); Reiche, Anal. Univ. Chile cxxi. 807 (1908) and Fl. Chile v. 212 (1910). *E. tenuicaule* Ph. Linnaea xxix. 18 (1857). *A. tenuicaulis* Macbr. Proc. Am. Acad. li. 544 (1916). (?) *E. illapelinum* Ph. Anal. Univ. Chile xc. 548 (1895).

ARGENTINA. CHABUT: Rio Palena, March 17, 1900, *Spegazzini* (G). CHILE. COLCHAGUA: Malloa, Oct. 20, 1883, *no collector given* (MS). VALPARAISO: Viña del Mar, Sept. 15, 1894, *Buchtien 144* (MS); Casa Blanca, May 1856, *Harvey* (G); Valparaiso, *Borchers* (MS); Valparaiso, *Cumings 400* and *433* (G); Valparaiso, 1925, *Claude-Joseph 3620* and *3758* (US); Valparaiso, 1895, *Buchtien* (US). SANTIAGO: San Cristobal, 1917, *Baeza* (IP); San Cristoral, Oct. 1874, *no collector given* (MS); Cerro de Renca, Sept. 1876, *no collector given* (MS); Santiago, *Claude-Joseph 2204*, *2882* and *2886* (US); Nuñoa, Nov. 1922, *Claude-Joseph 2122* (US); Santa Rita, Oct. 12, 1879, *no collector given* (MS); Hacienda de Mercedes, 1888, *no collector given* (MS); Macul, Sept. 1855, *no collector given* (MS); Prov. Santiago, Oct. 1830, *Gay 1624* (MS, TYPE of *E. tenuicaule;* G, photo.); (?) Cordillera de las Arañas, *no collector given* (MS). ACONCAGUA: Quillota, *Germain* (MS); Catapilco, Sept. 1865, *no collector given* (MS); Zapillar, 1908 and 1919, *Johow* (IP); between La Ligua and Los Molles, 1914, *Rose 19376* (US). COQUIMBO: Dept. Illapel, Oct. 1884, *no collector given* (MS, TYPE of *E. illapelinum;* G, photo.); Cerrillos, Dept. Ovalle, 1917, *Baeza* (IP). INDEFINITE: no locality given, *Bertero 445* (G); Quillota and Rancagua, *Bertero 1159* and *443* (NY).

This is a very common and very frequently collected plant of central

Chile and apparently the predominating one of the section *Allocarya* in the Santiago-Valparaiso region. Very clearly it is the *Myosotis procumbens* of Colla. It has been the plant most commonly associated with Ruiz & Pavon's *Lithospermum muricatum*, though in most cases with some doubt. That latter species is said to have been based upon material from Concepcion, which is quite south of the known range of *P. procumbens* in Chile and whence I have seen no material that is satisfactorily covered by Ruiz & Pavon's description. *Lithospermum muricatum* is described as having muricate nutlets which is not the case in *P. procumbens*. Being quite uncertain as to the identity of *L. muricatum* R. & P., I have been forced to list it among the poorly understood and unrecognized species.

Plagiobothrys procumbens is closely related to *P. Greenei* and related forms of California. It is a less robust plant, with small lanceolate calyx-lobes and somewhat smaller nutlets than in *P. Greenei*, but is quite similar and probably conspecific with *P. Piperi* Johnston, cf. Contr. Gray Herb. lxviii. 75 (1923).

The Chilean plants vary in the roughenings of the nutlets. There are two common forms which apparently grow in the same places. In one form the nutlets are alike, all of them being reticulate-rugose. In the other form the axial nutlet is more or less differentiated, usually being duller in color and having rather prominent frequently more or less glochidiate papillae or subulate appendages, which either replace or surmount the reticulate ridging. Practically all the specimens I have seen fall into one or the other of these two forms. These forms most decidedly do not have distinct ranges. In a few cases I have noted that the early flowers on a plant had the axial nutlet differentiated, whereas the later flowers produced only homomorphous nutlets

Another very much rarer variation is represented by Baeza's collection from the Province of Coquimbo. This has nutlets slightly smaller but otherwise quite indistinguishable from those particular forms of *P. Greenei*, sensu lat., which Piper, Contr. U. S. Nat. Herb, xxii. 82 and 89 (1920), treated as *Allocarya Eastwoodae* and *A. Greenei*. In the Chilean form mentioned the nutlets are all alike, 1.5 mm. long, dull and are all armed with abundantly glochidiate subulate-appendages. The scar is very deeply excavated. More of this peculiar form is needed so that its status can be determined.

15. **P. polycaulis** (Ph.), comb. nov. Annual; stems 5–15 cm. tall, one to several, loosely ascending to erect, strigose; leaves linear or oblance-linear, 2–3 cm. long, 1–2 mm. broad, strigose; racemes interruptedly bracteate or bracted only towards base, becoming loosely flowered; calyx usually densely appressed hispid-villous, commonly

fulvescent, becoming 2.5 mm. long with erect or strictly ascending oblong-lanceolate or broadly linear lobes; pedicels short; corolla small, 2–2.5 mm. broad; nutlets ovate often broadly so, ca. 1 mm. long, low reticulate-rugose, keeled dorsally, rounded laterally; scar suprabasal, small, deltoid, solid, on or slightly above level of the ventral keel; gynobase broadly pyramidal; style surpassed by nutlets.—*Eritrichium polycaule* Ph. Anal. Univ. Chile xc. 542 (1895). *E. delicatulum* Ph., l. c. 544. *E. flavicans* Ph. l. c. 544. *E. graminifolium* Ph. l. c. 547. *E. bracteatum* Ph. l. c. 548. *E. vernum* Ph. l. c. 550.

CHILE. VALDIVIA: Valdivia, Oct. 1852, *Philippi* (MS, TYPE of *E. vernum;* G, photo.) BIO-BIO: Coigue, 1915, *Ochoa* (IP). CONCEPCION: San Vicente, Nov. 1887, *Philippi* (MS, TYPE of *E. flavicans;* G, photo.). ÑUBLE: Chillan, 1869, *Man. Ant. de Solis* (MS, TYPE of *E. delicatulum;* G, photo.); "Ñuble ?, col. *Puga?*" (MS, TYPE of *E. graminifolium;* G, photo.). CURICO: Prov. Curico, 1892, *Vidal* (MS, TYPE of *E. bracteatum;* G, photo.). SANTIAGO: (?) between Colina and Batuco, Sept. 1899, *Reiche* (MS). INDEFINITE: specimen without data (MS, TYPE of *E. polycaule;* G, photo.).

This plant apparently replaces *P. procumbens* in south-central Chile. It is clearly related to that species but is distinguished by its smaller nutlets which do not have cristate dorsal margins and have a small solid scar seldom sunk below the level of the ventral keel. The inflorescence is rather less abundantly bracteate and is frequently practically bractless.

16. **P. calandrinioides** (Ph.), comb. nov. Annual; stems several, prostrate or loosely ascending, 5–18 cm. long, strigose; leaves oblong-linear to narrowly linear, obtusish, 1–5 cm. long, 1–2.5 mm. broad; racemes loose or dense, interruptedly pauci- to multi-bracteate; calyx strigose, usually somewhat tawny above, becoming 2–3.5 mm. long, with erect or strictly ascending linear-oblong or lanceolate lobes; pedicels obscure, 0.5–1 mm. long; corolla 1–3 mm. broad, white; nutlets oblong-ovate, 1.5–2.3 mm. long, compressed, dark and somewhat glossy, irregularly rugose with the broad ridges usually low and sinuately transverse, granulose-tuberculate, medial dorsal keel obscure, ventral face broadly angled; scar suprabasal, deltoid to cuneate, about flush with crest of the well developed ventral keel, somewhat oblique; style much surpassed by the nutlets.—*Eritrichium calandrinioides* Ph. Anal. Univ. Chile xc. 541 (1895). *E. nubigenum* Ph. ex. Meigen in Engler, Bot. Jahrb. xvii. 267 (1893), nomen. *Allocarya sessiliflora*, var. *nubigena* Ph. ex Reiche, Anal. Univ. Chile cxxi. 806 (1908) and Fl. Chile v. 212 (1910). *E. albiflorum* of Griseb. Abh. K. Ges. Wiss. Goettingen vi. 131 (1854), as to Lechler's plant, not synonymy. *P. Lechleri* Johnston, Contr. Gray Herb. lxviii. 79 (1923).

CHILE. CURICO: Prov. Curico, 1892, *Vidal* (MS). SANTIAGO: Valle Largo, Cordillera de Santiago, Feb. 1892, *Philippi* (MS, TYPE of *E. nubigenum;* G, photo.); Las Arañas mines, 1861, *Philippi* (MS, TYPE of *E. calandrinioides;* G, photo.). MEGALLANES: sandy strand, Beagle Canal on north shore of Navarino Island, Feb. 1922, *Gusinde 69* (G).

ARGENTINA. Rio Negro: along the river in vicinity of General Roca, Oct. 10, 1914, *Fischer 135* (G, US, FM). SANTA CRUZ: arid subsaline places near Rio Santa Cruz, Feb. 19, 1882, *Spegazzini* (G); Isla Pavon, Rio Santa Cruz, Feb. 9, 1882, *Spegazzini* (G); wet places along Rio Deseado, Jan. 1899, *Ameghino* (G); Patagonia, lat. 50°–53°, *Moreno & Tonini 529* and an unnumbered collection (NY).

This species appears to be the common Patagonian member of the section *Allocarya.* It has been much confused and has been misdetermined as *E. humile, E. uliginosum* and *E. procumbens.* With the exception of a collection of *P. procumbens* from the Cordilleras of Chabut, *P. calandrinioides* is the only species of its section that I have seen from Patagonia or Fuegia. It is very readily recognized by its large oblong-ovate nutlets which are compressed and are marked by broadly spaced wide, low, more or less sinuous transverse ridges. Its nearest relative is *P. oppositifolius.*

The range of *P. calandrinioides* is interesting and perhaps worthy of some comment. The plant, though seeming to be primarily Patagonian, occurs on the western slope of the Cordilleras above Santiago. Although the Cordilleras are highest in this district a number of herbaceous *Boraginaceae,* commonly of low altitudes, appear to cross the continental divide there. The most striking examples of these are *Cryptantha globulifera, Amsinckia tessellata* and *Plagiobothrys verrucosus.*

17. **P. oppositifolius** (Ph.), comb. nov. Annual; stems several, prostrate, 5–15 cm. long, subsimple or loosely branched, loosely appressed short hispid-villous; leaves broadly linear, 1–2 cm. long, 1.5–3 mm. broad, obtusish, sparsely appressed hispid-villous; racemes bracted nearly throughout, becoming loosely flowered and 3–5 cm. long; calyx densely appressed hispid-villous, becoming 2–3 cm. long with lanceolate or oblong-linear erect or strictly spreading lobes; pedicels becoming 1 mm. long; corolla 2–3 mm. broad; nutlets narrowly to broadly ovate, 1.5–1.8 mm. long, thick, not strongly compressed, irregularly rugose with the ridges usually broad and low and frequently absent or obscure particularly below the middle, medial dorsal keel low and usually rounded and obscure below the middle, ventral face prominently angled; scar almost basal, oblique, small and solid; gynobase broadly pryamidal; style much surpassed by the nutlets.—*Eritrichium oppositifolium* Ph. Anal. Univ. Chile xc. 542 (1895). *Allocarya oppositifolia* Reiche, Anal. Univ. Chile cxxi. 807 (1908) and Fl.

Chile v. 212 (1910). *E. cinereum* Ph. l. c. 545. *A. cinerea* Reiche, l. c. 808 and l. c. 213. *E. limonium* Ph. l. c. 546.

CHILE. MALLECO: Ercilla, Araucania, Nov. 1887, *Philippi* (MS, TYPE of *E. limonium;* G, photo.); Araucania, Nov. 1887, *Philippi* (MS, TYPE of *E. cinereum;* G, photo.). CAUTIN: Temuco, 1915, *Baeza* (IP). INDEFINITE: without data (MS, TYPE of *E. oppositifolium;* G, photo.).

A close relative of *P. calandrinioides* differing in its weakly compressed nutlets and more southerly Chilean range.

18. **P. pulchellus** (Ph.), comb. nov. Annual; stems several, prostrate or decumbent, 1–1.5 dm. long, branched, appressed short-villous; leaves linear, 1–3 cm. long, 1.5–2.5 mm. broad, very sparsely strigose, margins sparsely short-ciliate and pustulate; racemes 2–5 cm. long, usually geminate, bractless; calyx densely appressed short-villous, fulvescent especially at tips, becoming 2–3 mm. long, with oblong-lanceolate erect or spreading lobes; pedicels ca. 1 mm. long; corolla 4–5 mm. broad; nutlets ovate, 1.3–1.5 mm. long, obscurely an finely granulate, sparsely papillate, occasionally obscurely transverse-rugose towards the base, medial dorsal keel very sharp above the middle; scar suprabasal, deltoid, concave, clearly below the level of the strong ventral keel; gynobase globose-pyramidal; style just surpassed by nutlets.—*Eritrichium pulchellum* Ph. Anal. Univ. Chile xc. 545 (1895).

CHILE. MALLECO: [Traiguen?] Araucania, Nov. 1887, *Philippi* (MS, TYPE; G, photo.).

I was unable to locate in the Philippi Herbarium any material given as from Traiguen, the locality cited by Philippi when he described the species. The species is represented at Santiago by two plants of the same collection which have been both labeled and determined by Philippi. These have only the following data: "Eritrichium pulchellum Ph., Araucania, Nov. 1887." During Nov. 1887 Philippi was collecting in the province of Malleco, cf. Gartenflora xxxviii. 88–90 (1889). Since Traiguen is in that province perhaps the locality was supplied from memory in an attempt to give a more precise source for the specimen than merely the vague indefinite regional name, "Araucania."

As defined by Philippi his species is an aggregate. The two plants in the herbarium at Santiago represent different species, one being the plant here treated as *P. pulchellus*, the other apparently a phase of *P. corymbosus*. The original description is very ambiguous, though in the majority of points it seems to fit the plant I have described above especially so where the nutlets are described as "mui arrugadas" and the hairs of the calyx as "amarillentos."

The species as here defined is most related to *P. corymbosus.* In having papillate rather than rugose nutlets, however, the plant is so different that it seems best treated as specifically distinct. Although the relationships are patent I have seen no suggestion of the occurrence of transitional forms.

19. **P. uliginosus** (Ph.), comb. nov. Annual; stems usually solitary, weak and slender but apparently erect, becoming 2–4 dm. tall, sparsely and obscurely villous-strigose, branches few and strictly ascending; leaves linear or lance-linear, 1–5 cm. long, 1.5–2.5 mm. broad, obtusish, very sparsely villous-strigose, mostly opposite; racemes usually geminate, bractless, 3–15 cm. long, becoming elongated and loosely flowered; calyx densely appressed tawny-pubescent, becoming 2–3 mm. long, with the narrowly lanceolate lobes erect to spreading; pedicels usually slender, becoming 1–3 mm. long and somewhat spreading; corolla conspicuous, white, 4–6 mm. broad; nutlets ovate, ca. 1.7 mm. long, pale, granulate, reticulate-rugose with the rugae narrow and sharp, medial dorsal keel definite, ventral keel strong, scar nearly basal; gynobase hemispheric-pyramidal; style reaching to tip of nutlets.—*Eritrichium uliginosum* Ph. Anal. Univ. Chile xliii. 519 (1873). *Allocarya uliginosa* Greene, Pittonia i. 14 (1887); Reiche, Anal. Univ. Chile cxxi. 807 (1908) and Fl. Chile v. 213 (1910). *Cynoglossospermum uliginosum* Kuntze, Rev. Gen. iii. pt. 2, 204 (1898). (?) *E. tenuifolium*, var. *pulchellum* Ph. Anal. Univ. Chile xc. 547 (1895). (?) *A. tenuifolia*, var. *pulchella* Reiche, l. c. 805 and l. c. 211.

CHILE. Ñuble: Chillan, *Reed* (G); "Prov. de Chillan," Dec. 1869, *Philippi* (MS, type of *E. uliginosum;* G, photo.). Indefinite: (?) collection without data (MS, type of *E. tenuifolium* var. *pulchellum;* G, photo.).

When *E. uliginosum* was described the type specimens were given as from the province of Colchagua. This was probably a slip of the pen, for the only specimens in the herbarium at Santiago covered by the original description are those labeled, "Eritrichium uliginosum Ph. Prov. de Chillan, Decemb. 1869." The species is closely related to *P. corymbosus* but differs in its more sharply ridged nutlets, and in its more slender, erect and taller habit. It is positively known only from Ñuble, which is some distance north of the range of its relative. The type of *E. tenuifolium*, var. *pulchellum* is doubtfully associated with *P. uliginosus.* It agrees with the present species in the sculpturing of the nutlets, in length of style and in its habit and large flowers, but differs from the Chillan material in its low (only 5–7 cm. tall) stoutish habit and conspicuously rufous pubescence. The source of the type material is not known.

20. **P. pedicellaris** (Ph.) Johnston. Annual; stems solitary or few, trailing, subsimple, 5–10 cm. long, finely and closely short-strigose; leaves linear, 3–5 cm. long, 1–1.5 mm. broad, very gradually contracted towards the acutish apex, finely and closely short-strigose; racemes not much if at all surpassing the leaves, 1–3 cm. long, leafy-bracted at the base, very loosely flowered; pedicels slender, those of the lower flowers elongate and spreading, becoming 8 mm. long; calyx appressed short-villous, fulvescent, becoming 3 mm. long, with erect slender linear lobes; corolla conspicuous, ca. 4 mm. broad; nutlets ovate, ca. 1.3 mm. long, reticulate-rugose, with the ridges narrow but not prominent, medial dorsal and ventral keels fairly well developed; scar just above the base of the nutlet, small, oblique; gynobase low, broadly pyramidal; style elongate, surpassing the nutlets.—Contr. Gray Herb. lxviii. 75 (1923). *Eritrichium pedicellare* Ph. Anal. Univ. Chile xc. 549 (1895). *Allocarya pedicellaris* Reiche, Anal. Univ. Chile cxxi. 809 (1908) and Fl. Chile v. 214 (1910). *E. tenuifolium*, var. *longipes* Ph. Anal. Univ. Chile xliii. 518 (1873). *A. tenuifolia*, var. *longipes* Reiche, l. c. 805 and l. c. 211.

CHILE. INDEFINITE: Pinales de la cordillera de Nahuelbuta, *Volckmann* (MS, TYPES of *E. pedicellare* and *E. tenuifolium* var. *longipes;* G, photo.).

Philippi's species and variety cited above are obviously based on specimens of the same collection and are unquestionably synonymous. The exact type-station is somewhere in the Cordillera de Nahuelbuta, the range of mountains whose crest is the boundary between the province of Arauco and adjacent Bio-Bio and Malleco. The species is closely related to *P. corymbosus*. It appears to differ, however, in its shorter subsimple very leafy stem, racemes which are not projected above the leaves, and very elongate lower pedicels. Before the species can be definitely accepted, however, more material should be studied and some idea gained as to the constancy of the characters here given.

21. **P. corymbosus** (R. & P.), comb. nov. Annual; stems usually several, decumbent, branched, 5–20 cm. long, finely strigose; leaves linear to filiform-linear, 1–5 cm. long, 2–2.5 mm. broad, mostly opposite, finely and sparsely strigose; racemes elongating, slender, bractless, frequently geminate, becoming 4–6 cm. long; mature calyx 2–3 mm. long, usually very tawny with a rather dense appressed pubescence, with the lance-linear lobes erect or ascending; pedicels 0.5–2 mm. long, usually strict and stiffish; corolla evident to conspicuous, white or cream-colored, 4–6 mm. broad; nutlets ovate, 1–1.3 mm. long, finely granulate, irregularly somewhat reticulate-rugose with the ridges low and rather obscure, dorsal keel obscure or definite only towards apex,

ventral keel definite; scar suprabasal, oblong, solid; gynobase pyramidal; style shortly surpassing the nutlets.—*Myosotis corymbosa* R. & P. Fl. Peruv. ii. 5 (1799); Lehm. Asperif. i. 82 (1818); Reiche, Anal. Univ. Chile cxxi. 834 (1908) and Fl. Chile v. 239 (1910). *Cryptantha corymbosa* Johnston, Contr. Gray Herb. lxviii. 54 (1923). *Cynoglossum sessiliflorum* Poepp. in herb. *Eritrichium sessiliflorum* DC. Prodr. x. 133 (1846); Clos in Gay, Fl. Chile iv. 470 (1849). *Allocarya sessilifolia* Greene, Pittonia i. 17 (1887). *A. sessiliflora* Reiche, l. c 806 and l. c. 211. *E. humile*, var. *capitatum* Clos in Gay, l. c. 471; Gray, Proc. Am. Acad. xx. 267 (1885). *E. tenuifolium* Schlecht. ex sched.; Ph. Anal. Univ. Chile xliii. 519 (1873), nomen; Ph. l. c. xc. 546 (1895). *Krynitzkia tenuifolia* Gray, Proc. Am. Acad. xx. 267 (1885). *A. tenuifolia* Greene, Erythea iii. 57 (1895); Reiche, l. c. 805 and l. c. 210. *P. tenuifolius* Johnston, l. c. 78.

CHILE. LLANQUIHUE: playa del puerto de Nahuelhuapi, *collector not given, no. 37* (MS). VALDIVIA: Valdivia, Oct. 1857, *Philippi* (MS); Canelos, *collector not given, no. 295* (MS); Ranco, Jan. 1887, *Otto* (MS); shore of Lago Ranco, Jan. 1860, *Philippi* (MS); Arique, Nov. 1854, *Lechler 255* (MS); Isla Valenzula, Nov. 1850, *Lechler 255* (G); streambank, Valdivia, 1899, *Buchtien* (US); Valdivia, 1896, *Buchtien* (US); Valdivia, 1862, *Bridges 785* (NY); Panguipulli, ca. 140 m. alt., 1924, *Hollermayer 352* (G); Panguipulli, 1924, *Claude-Joseph 2693* (US). MALLECO: Collipulli, 1915, *Baeza* (IP); [? Traiguen] Araucania, Nov. 1887, *Philippi* (MS). BIO-BIO: Trapatrapa, Feb. 1887, *Philippi* (MS). INDEFINITE: collection lacking data, *Poeppig 247* (G, photo of TYPE of *E. sessiliflorum*).

A very variable species that future study may cause to be further enlarged so as to include *P. pulchellus*, *P. uliginosus* and *P. pedicellaris*. As here defined, however, the species includes large-flowered annuals with a sparse usually reddish-brown pubescence, short pedicels and nutlets with low irregularly reticulate ridges. It is one of the more southerly ranging of the Chilean species and appears to be quite common within the area of its dispersal.

I am accepting *Plagiobothrys corymbosus* as the proper name for the present species since Dr. A. Brand, who has seen authentic material, writes me that *Myosotis corymbosa* R. & P. is an *Allocarya* apparently of this relationship. The original description of *M. corymbosa* gives, "corolla calyce triplo major." The species described above is the only large-flowered one growing in southern Chile that seems to fit the original description. The type is said to have come from Concepcion.

I refer *E. sessiliflorum* here after a study of a photograph of the type. The type specimen seems to have evident corollas and the characteristic dark dense pubescence on the calyces. Poeppig, who collected the type, explored in the province of Concepcion and

Bio-Bio and hence within the known range of the species as here defined.

22. **P. pratensis** (Ph.), comb. nov. Annual or perhaps persistent; stems several, prostrate or decumbent, 1–2 dm. long, densely strigose; leaves 1–2.5 cm. long, oblong-spathulate to linear, obtuse, finely strigose; racemes bractless, 2–3 cm. long, densely flowered; calyx densely silky-strigose, becoming 2–3 mm. long with erect lance-oblong or broadly linear obtuse lobes; pedicels 1–2 mm. long; corolla 3–4 mm. broad; nutlets broadly ovate, 1.5 mm. long, finely granulate, roughened with low rather inconspicuous reticulate ridges, dorsal keel rounded but definite to below the middle; areola almost basal, small, oblique, clearly much below the level of the strong ventral keel; style surpassed by nutlets or about reaching to their tips.—*Eritrichum pratense* Ph. Linnaea xxxiii. 192 (1864); Reiche, Anal. Univ. Chile cxxi. 810 (1908) and Fl. Chile v. 215 (1910).

CHILE. LLANQUIHUE: between Roble and Pilmaiquen, Dept. Osorno, Jan. 1861, *Philippi* (MS, TYPE; G, photo.).

Both Philippi and Reiche have described this species as perennial. In the Museo Nacional at Santiago there are two plants of the original collection, both determined as *E. pratense* by Philippi. One of the plants is unquestionably annual, the other has a thickened root, but is otherwise similar. It is evident that Philippi's and Reiche's statements were based upon a study of the plant with the thickened root. This specimen exhibits the upper 1.5 cm. of the root which is about 4 mm. thick and bears at its crown what appears to be vestiges of old stem-bases. I suspect that the plant has been browsed upon and that its root-development is not at all typical of the species.

DOUBTFUL OR EXCLUDED SPECIES.

AMSINCKIA HUMIFUSA [Poepp.] Walp. Nov. Act. Acad. Caes. Leop.-Car. xix. suppl. 371 (1843); A. DC. Prodr. x. 133, note (1846). *Cynoglossum humifusum* Poepp. in sched. ex Walp. l. c. 372; Brand, Pflanzenr. iv. Fam. 252, i. 150 (1921). *Benthamia humifusa* Druce, Rep. Bot. Exch. Cl. Brit. Isl. iv. 298 (1916).—This plant is evidently a member of the section *Allocarya*. Its description, however, is too vague for recognition. See discussion under *P. congestus*.

Plagiobothrys mesembryanthemoides (Speg.) Johnston, Contr. Gray Herb. lxviii. 79 (1923) and l. c. lxxv. 42 (1925). *Eritrichium mesembryanthemoides* Speg. Anal. Soc. Cient. Argentina liii. 136 (1902).—Not a species of the *Boraginaceae*. This appears to be a member of the *Portulacaceae* and perhaps a CALANDRINIA.

PLAGIOBOTHRYS MURICATUS (R. & P.) Johnston, Contr. Gray Herb. lxviii. 79 (1923). *Lithospermum muricatum* R. & P. Fl. Peruv. ii. 4 (1799); Lehm. Asperif. ii. 327 (1818). *Eritrichium muricatum* A. DC. Prodr. x. 132 (1846); Ph. Anal. Univ. Chile xc. 540 (1895). *Allocarya muricata* Reiche, Anal. Univ. Chile cxxi. 809 (1908) and Fl. Chile v. 215 (1910).—The type of *L. muricatum* is said to have come from Concepcion, Chile. It is described as a prostrate annual herb with opposite leaves, small inconspicuous corollas and muricate nutlets. Possibly it is the same as *P. polycaulis* which has been collected near Concepcion. That species is an inconspicuously flowered plant but its nutlets are certainly not muricate.

12. **Amsinckia** Lehm.

Calyx cut to base into erect lanceolate or oblong lobes. Corolla tubular or salverform; tube cylindrical, glabrous, unappendaged; lobes spreading, rounded, imbricate; throat unappendaged; stamens included, affixed in the tube; filaments very short; anthers oblong, obtuse. Style filiform, included; stigma capitate, emarginate. Ovules 4. Cotyledons 2-parted. Nutlets 4, erect, angulate-ovoid, smooth or rough, unmargined, strongly keeled ventrally; areola inframedial, small, carunculate. Gynobase frustate, about half the height of the nutlets.—Annual herbs. Leaves alternate, linear to ovate, usually veinless. Racemes usually bractless.—Del. Sem. Hort. Hamburg 7 (1831). *Benthamia* Lindl. Nat. Syst. 241 (1830), nomen.

A genus of considerable technical difficulty which centers in western North America and has only two South American representatives.

KEY TO SPECIES.

Nutlets tessellate, 3–3.5 mm. long; corolla 6.5–7.5 mm. long; plants rather coarse ..... 1. *A. tessellata.*
Nutlets verrucose, 2–2.8 mm. long; corolla 3–7 mm. long; plants usually slender ..... 2. *A. hispida.*

1. **Amsinckia tessellata** Gray. Rather coarse plants, 8–20 cm. tall, with loosely or strictly ascending stems, shaggy-hirsute with the younger parts also somewhat hispid-villous; leaves firm, obtuse, appressed-hispid, usually densely pustulate; lower leaves somewhat crowded, oblanceolate, 4–6 cm. long, 7–9 mm. broad; middle cauline leaves gradually reduced, oblong to oblong-ovate; racemes usually short and densely flowered, 1–3 cm. long, solitary, bractless or bracted only at base; calyx densely appressed tawny-hirsute as well as short appressed white-villous, at maturity 6–8 mm. long with erect coarse lance-linear obtuse lobes; pedicels ca. 1 mm. long; corolla yellowish, 6.5–

7.5 mm. long, subtubular, limb ca. 2 mm. broad, throat weakly flaring, tube ca. 1 mm. thick; nutlets triangular, angulate, 3–3.5 mm. long, tessellate with flattened very crowded tuberculations, frequently with short transverse rugae along the medial line, the back very broadly obtuse, almost flat, with a weakly developed medial ridge.—Proc. Am. Acad. x. 54 (1875); Macbr. Contr. Gray Herb. xlix. 6 (1917).

ARGENTINA. CHABUT: along Rio Carren-leufú, March 1, 1900, *Spegazzini* (G).

CHILE. SANTIAGO: Las Arañas silver mines, Nov. 1861, *Philippi* (MS).

This species, frequent in the deserts of southwestern United States and now first reported from South America, was long ago known and distinguished by Spegazzini, Anal. Soc. Cient. Argentina liii. 137 (1902), who treated it as *A. pseudolycopsicoides* under the supposition that it was Clos's *A. angustifolia*, var. *pseudolycopsioides*. He reported the plant from Rio Carren-leufú and Lago Nahuel-huapi. Although apparently indistinguishable from some of the low spreading forms from North America, the two South American collections studied are not so tall nor so erect as the common forms of the species in the deserts of United States.

2. **A. hispida** (R. & P.) Johnston. Erect annual, 2–7 dm. tall, simple or loosely branched, conspicuously shaggy-hirsute and with the upper parts frequently finely villous-hispid as well; leaves hirsute, acute, gradually reduced up the stem; lower leaves usually crowded, oblanceolate, 5–15(–18) cm. long, 5–15(–24) mm. broad; cauline leaves linear to lanceolate, usually strictly ascending; racemes solitary or geminate, bractless or bracted only at base, much elongating, becoming very loosely flowered and 1–2.5 dm. long; calyx somewhat tawny, hirsute and more or less hispid-villous, becoming 4–6 mm. long with acuminate-linear or lance-linear lobes; pedicels ascending, 1–3 mm. long; nutlets triangular-ovate or triangular, angulate, incurved, 2–2.8 mm. long, granulate-tuberculate, commonly with strong irregular transverse crests, back definitely obtuse, the medial ridge frequently longitudinally cristate.—Johnston, Contr. Gray Herb. lxxiii. 75 (1924). *Lithospermum hispidum* R. & P. Fl. Peruv. ii. 5 (1799); Lehm. Asperif. ii. 328 (1818). *A. angustifolia* Lehm. Del. Sem. Hort. Hamburg 7 (1831) and Linnaea vi. Litt. 74 (1831); F. & M. Ind. Sem. Hort Petrop. ii. 26 (1835); DC. Prodr. x. 118 (1846); Clos in Gay, Fl. Chile iv. 473 (1849); Reiche, Anal. Univ. Chile cxxi. 833 (1908) and Fl. Chile v. 238 (1910); Johnston, Contr. Gray Herb. lxx. 44 (1924). *Benthamia angustifolia* Druce, List Brit. Pl. 103 (1908). *A. parviflora* Bernh. Del. Sem. Hort. Erf. (1833) and Linnaea x. Litt.

73 (1836). *L. calycinum* Moris, "Enum. Sem. Hort. (1831)" and Mem. Acad. Torino xxxvii. 98, t. 22 (1833). *L. chilense* Colla, Mem. Acad. Torino xxxviii. 127, t. 40 (1834). *A. angustifolia*, var. *pseudolycopsioides* Clos in Gay, Fl. Chile iv. 473 (1849). *A. pseudolycopsicoides* Speg. Anal. Soc. Cient. Argentina liii. 137 (1902). *Eritrichium pachnophilum* Wedd. Chlor. Andina ii. 87 (1859). *A. basistaminea* Cesati, Atti Acc. Sc. Nap. ser. 5, vii. 14 (1873). *B. basistaminea* Druce, Rep. Exch. Cl. Brit. Isl. iv. 298 (1916). *E. Mandonii* Ball, Jour. Linn. Soc. Bot. xxii. 51 (1885). *A. angustifolia*, var. *microcarpa* Speg. Anal. Soc. Cient. Argentina liii. 136 (1902). *Cryptantha Spegazzinii* Johnston, Contr. Gray Herb. lxviii. 54 (1923). *Plagiobothrys aurantiacus* Brand in Fedde, Repert. xx. 46 (1924).

ARGENTINA. Santa Cruz: vicinity of Lago Argentina, 1907–08, *Furlong 120* (G, NY); Patagonia, lat. 50°–53°, *Moreno & Tonini 106*, *309* and *531* (NY). Chabut: very dry slope near Cabo Raso, Feb. 15, 1900, *Spegazzini* (G); no locality given, 1898, *Kowbowky* (G). Rio Negro: vicinity of General Roca, 250–360 m. alt., Sept. 25, 1914, *Fischer 81* (G, US, FM); dry gravelly place at junction of Rio Neuquen and Rio Negro, Jan. 21, 1898, *Spegazzini* (G).

CHILE. Megallanes: Cabo Negro, Nov. 1867, *Cunningham* (G); Packet Harbor, Nov., *Lechler 1133* (MS); Oazy Harbor, Nov. 1852, *Lechler 1133* (MS); Fuegia, Feb. 1879, *O.* (MS). Ñuble: Chillan, *Man. Ant. de Solis* (MS). OHiggins: Rancagua, July 1878, *collector not given* (MS); Rancagua, *Bertero 379* (G) Santiago: Santiago, Aug. 1830, *Gay 1628* (MS); Santiago, Nov. 1860, *no collector given* (MS); Santiago, Oct. 1858, *no collector given* (MS); Santiago, Nov. 1918, *Claude-Joseph 706* (US); Santiago, *Gay 48* (G, photo of type of *A. angustif.* var. *pseudolycopsioides*); Cerro San Cristobal, Oct. 1886, *Gigoux* (G); San Cristobal, Nov. 1900, *Hastings 114* (US); San Cristobal, 1917, *Baeza* (IP); Cerro de San Bernardo, *Reed* (G); San Bernardo, 1923, *Baeza* (IP); Quinta Normal, Nov. 1877, *no collector given* (MS); Peñaflor, 1921, *Baeza* (IP); Talagante, 1916, *Baeza* (IP); San Juan de Pirque, 1914, *Baeza* (IP). Valparaiso: Limache, [*Bertero*] (US); hills, Quillota, 1829, *Bertero* (G); Valparaiso, *Cumings 512* (G). Aconcagua: Zapallar, 1908 and 1909, *Johow* (IP); Las Astas, Oct. 1914, *Rose 19358* (US, NY). Coquimbo: Frai Jorge Estancia, Aug. 15, 1917, *Skottsberg 804* (G); sand, Herradura near Coquimbo, Sept. 27, 1917, *Skottsberg 1060* (G); Punta de Teatinos, Nov. 1925, *Werdermann 878* (G); Coquimbo, Oct. 1878, *Ortega* (MS); Coquimbo, 1889–90, *Geisse* (MS); Coquimbo, 1856, *Harvey* (G). Antofagasta: Tocopilla, 1918, *Gülland* (IP); Tocopilla, Oct. 1925, *Johnston 3576* (G). Tarapacá: Quebrada Huantajaya, Iquique, ca. 700 m. alt., *Werdermann 761* (G). Indefinite: costa, Nov. 4, 1920, *Claude-Joseph 1210* (US); no locality given, *Gay* (G) and *Gilles* (G).

BOLIVIA. Potosi: Quebrada de las lagunas, March, *D'Orbigny 1448* (G, frag. type of *E. pachnophilum*). Oruro: Pazna, 3900 m. alt., Apr. 3, 1921, *Asplund 5893* (US). La Paz: General Campero, 4200 m. alt., March 4, 1921, *Asplund 5892* (US); Calavaya near Sorata, 2700–2900 m. alt., *Mandon 378* (G, NY; isotypes of *E. Mandonii*).

PERU. Cusco: Paucartambo, 3500–3700 m. alt., *Herrera 1006a* (US). Lima: abandoned field, Rio Blanco, 4500 m. alt., March, 1923, *Macbride 2968* (G, FM); grassy canyon slope, Rio Blanco, 3600 m. alt., May 1922, *Macbride & Featherstone 729* (G, FM); Chicla, 3600–3900 m. alt., April 1882, *Ball* (NY). Huanuco: edge of alfalfa-field, Llata, 2100 m. alt., *Macbride & Featherstone 2288* (G, FM).

ECUADOR. CAÑAR: vicinity of Cañar, Sept. 16, 1918, *Rose 22728* (G, NY). PICHINCHA: plains of Chillagallo, Sept. 1856, *Remy* (G, fragment). INDEFINITE: without data but probably Ecuadoran, *André 662* (NY).

Considering the extent of its range, this species is quite constant and shows very little of that capacity for bewildering variation which is so characteristic of its immediate relatives in North America. In habit and corolla-structures and -form, the plant is not unusually variable. The most striking variations are those of nutlet-size. The majority of the specimens studied had nutlets about 2.5 mm. long. In Asplund's Bolivian collections, and in that cited from extreme northern Chile, the nutlets are slightly larger, becoming 2.8 mm. long. On the other hand in the material sent me by Spegazzini from the confluence of the Rio Negro and Rio Neuquen as representing *A. angustifolia*, var. *microcarpa*, the nutlets are about 2 mm. long. While worthy of note these variations in size of nutlets scarcely merit nomenclatorial recognition.

13. **Lappula** Moench.

Calyx 5-parted into spreading lanceolate lobes. Corolla with a rather short tube; lobes rounded, ascending, imbricate; throat closed by intruded appendages; stamens affixed in the tube, included; filaments slender, short; anthers oblong, obtuse. Style short surmounting the subulate-columnar gynobase, commonly surpassing the mature nutlets; stigma subcapitate. Ovules 4. Nutlets 4, erect, smooth or verrucose, narrowly but firmly attached to the gynobase along the length of the well developed ventral keel, back angulate or margined by a single or double row of prickles which by confluence frequently form a wing-like or cupulate border.—Annual or rarely perennial herbs. Leaves alternate, usually narrow, firm and veinless. Flowers small, blue or white, on usually erect pedicels or rarely subsessile, in bracted racemes.—Meth. 416 (1794); Johnston, Contr. Gray Herb. lxxiii. 60 (1924). *Echinospermum* Sw. ex Lehm. Asperif. i. 113 (1818). *Staurina* Nutt. Jour. Acad. Philad. i. 182 (1848).

A very difficult genus, the South American forms of which are very imperfectly known. The species are mainly critical ones, being largely separated by technical characters of the fruit, such as size and form of the nutlets, their surface and the characters of the dorsal-margin.

KEY TO SPECIES.

Nutlet-margin armed with a row of stout flattened glochidiate subulate appendages.....1. *L. Redowskii.*
Nutlet-margin bearing an up-turned cupulate wing.....2. *L. texana.*

1. **Lappula Redowskii** (Hornem.) Greene. Annual; stems erect, 1.5–3 dm. tall, ascendingly long-branched from the base, appressed villous-hispid; leaves appressed villous-hispid becoming somewhat glabrate, lower ones oblanceolate or spathulate, cauline ones linear or oblong; corolla small, white, 1–2 mm. broad; nutlets 2–3 mm. long, homomorphous, verrucose or rugose-verrucose, margined dorsally with a single row of compressed subulate glochidiate appendages.—Pittonia ii. 182 (1891). *Myosotis Redowskii* Hornem. Hort. Hafn. i. 174 (1813). *Echinospermum patagonicum* Speg. Anal. Soc. Cient. Argentina liii. 79 (1902). *L. patagonica* Macl. Rev. Fl. Patag. 214 (1915).

ARGENTINA. Santa Cruz: dry places near Puerto de San Julian, Feb. 3, 1882, *Spegazzini* (G). Chabut: deserts near Cholita, near Rio Chabut, Feb. 23, 1900, *Spegazzini* (G). Rio Negro: vicinity of General Roca, *Fischer 124* (G, US, FN). Mendoza: vicinity of Mendoza, Jan. 1908, *Carette 256* (G).

The material above cited is quite variable and I suspect that several varieties may eventually be distinguished among the Argentine forms of the species. The material available to me for study is hopelessly inadequate for a satisfactory understanding of these forms.

2. **L. texana** (Scheele) Britt. Annual; stems erect, 1–1.5 dm. tall, appressed hispid-villous; leaves appressed hispid-villous, lower ones spathulate, the upper ones linear or oblong; corolla small, white, 1–1.5 mm. broad; nutlets homomorphous, more or less verrucose, with a broad toothed up-turned and hence deeply cupulate margin, the marginal teeth triangular-subulate and glochidiate.—Mem. Torr. Bot. Cl. v. 273 (1894); Johnston, Contr. Gray Herb. lxx. 49 (1924)

ARGENTINA. Santa Cruz: dry places, Puerto de San Julian, Feb. 3, 1882, *Spegazzini* (G).

The above cited collection seems to be indistinguishable from *L. texana*, var. *columbiana* (Nels.) Johnston, l. c., of northwestern United States. It was sent me mixed with specimens of *L. Redowskii*.

14. **Hackelia** Opiz.

Calyx cut to the base into spreading ovate to oblong or lanceolate lobes. Corolla with short or elongate tube; lobes rounded, imbricate; throat with trapeziform intruded appendages; stamens included, affixed at middle of tube; filaments slender, short; anthers oblong to elliptical Style slender, scarcely if at all surpassing the nutlets; stigma capitate. Ovules 4. Nutlets 4, erect, ovate, affixed ventrally to the pyramidal gynobase by a broad medial areola, margin with

subulate glochidiate appendages which are frequently confluent at the base, back smooth or with glochidiate appendages.—Biennial or perennial or rarely annual herbs. Leaves alternate, broad and veiny. Flowers in naked or inconspicuously bracted racemes paniculately disposed. Pedicels slender, recurving in fruit.—Opiz in Bercht. Fl. Boehm. ii. pt. 2, 146 (1839); Johnston, Contr. Gray Herb. lxviii. 43 (1923).

A genus centering in western North America with outlying species in South America, and Eurasia. The South American forms are very poorly understood.

1. **Hackelia revoluta** (R. & P.) Johnston. Biennial or perennial; stems 4–8 dm. tall, erect, one to several, usually loosely branched above, appressed hispid-villous being usually antrorsely so above and retrorsely so below the middle; leaves acute, the upper face scabrous, appressed short-hispid with bulbous- or pustulate-based hairs, the lower surface paler, sparsely pubescent to velutinous, the bases decurrent forming obscure angles to the stems; lower leaves with lanceolate to elliptical blades, 5–15 cm. long, 1–5 cm. broad, narrowed below into a petiole 5–15 cm. long; middle cauline leaves narrowed to a sessile base, gradually reduced up the stem; racemes terminal and from upper axils; calyx cut into acute, ovate or ovate-lanceolate lobes; corolla blue or white, the limb plane or shallowly convex, 3–7 mm. broad; nutlets somewhat heteromorphous, 2.5–4 mm. long, some of them armed with long slender glochidiate appendages, others with only a few short glochidiate appendages.—Contr. Gray Herb lxviii. 45 (1923). *Cynoglossum revolutum* R. & P. Fl. Peruv. ii. 6 (1799); Lehm. Asperif. i. 147 (1818). *Lappula revoluta* Brand in Fedde, Repert xiv. 148 (1915). *C. ovatifolium* Griseb. Abhandl. Ges. Wis. Goettingen xxiv. 271 (1879). *L. revoluta*, f. *ovatifolia* Brand, l. c. *C. Fiebrigii* Krause in Engler, Bot. Jahrb. xxxvii. 634 (1906). *L. revoluta*, f. *Fiebrigii* Brand, l c *C. parviflorum* Krause, l. c. *C. andicolum* Krause l. c. 635. *L. costaricensis* Brand in Fedde, Repert. xviii. 310 (1922). *H. costaricensis* Johnston, l. c. 46 *L. guatemalensis* Brand in Fedde, Repert. xviii. 311 (1922).

COLOMBIA. Cundinamarca: moist rocky canyon, Rio San Francisco above Bogotá, 2700–2800 m. alt., *Pennell 1939* (NY); meadow on sabana, Sibate, 2600–2650 m. alt., *Pennell 2473* (NY); wet forest slope on mount south of Sibate, 2900–3000 m. alt., *Pennell 2448* (G, NY); El Boqueron, mountains east of Bogotá, *Holton 530* (G). Tolima: forest, Old Quindio Trail between the summit and La Ceja, 3100–3500 m. alt., *Killip & Hazen 9515* (G, NY); forest below Paramo de Ruiz, 3100–3500 m. alt., *Pennell 3102* (G, NY). Caldas: wayside on hill, Pinares above Salento, 2600–2900 m. alt., *Pennell 9183* (G). Cauca: paramo, Las Delicias, Andes of Popayan, 2800–3400 m. alt., 1896, *Lehmann B.T.-673* (NY). Indefinite: San Juan, Quindio,

March 8–10, 1876, *André 2268* (NY); without locality, *Ariste-Joseph A-856* (US).

ECUADOR. INDEFINITE: without locality, *Spruce 5554* (G) and *Jameson* (US).

PERU. CUSCO: Cusco, 3450–3650 m. alt., March 1925, *Herrera 525* (US); Cusco, 3000–3600 m. alt., July 1923, *Herrera* (US).

BOLIVIA. CHUQUISACA: Calderillo, 3300 m. alt., *Fiebrig 2476* and *3174* (G).

ARGENTINA. CATAMARCA: La Ollada, 3100 m. alt., Jan. 10, 1916, *Jörgensen 1077* (G); El Cordallo, Jan. 1, 1917, *Jörgensen 1077* (US).

The present treatment of the South American species of *Hackelia* is quite unsatisfactory and must be subjected to severe revision when more material becomes available for study. I feel quite sure that at least two South American species will then be recognized. The material I have cited from Colombia and Ecuador differs from that from Peru, Bolivia and Argentina in being commonly more robust and more evidently hairy, and in having tomentose growing parts, usually villulose faucal appendages and larger firmer leaves that turn dark in drying. This plant of northwestern South America also occurs in the mountains of Central America whence I have studied material from Panama (*Pittier 3106*), Costa Rica (*Pittier 7537*, *Dodge 3429*), Guatemala (*Seler 3144*, *Heyde & Lux 3043*) and Mexico (*Ghiesbreght 115*). The Guatemalan collections mentioned are the basis of *Lappula guatemalensis* Brand. Judging from descriptions I assume that *L. costaricensis* Brand, from San José, Costa Rica, is a small-flowered form of this same species. Two collections from Mt. Orizaba, Mexico (*Botteri 179* and *Seaton 22*) are quite like the Central American plants but differ in their very small corollas. Since the type of *Cynoglossum* or *Lappula mexicana* came from a low mountain just to the east of Orizaba it is possible that it is the same as the plants from Orizaba and hence only a small-flowered phase of the plant of Central and northern South America. In that case the Mexican plant from Hidalgo (*Coulter 1056*), Mexico (*Pringle 5259, 9318; Bourgeau 881* and *Harshberger 130*) and Oaxaca (*Pringle 4832; Nelson 1045*) passing as *mexicana* is without a name.

The material I have from Peru, Bolivia and Argentina is quite inadequate as a basis of worth-while opinions as to the status of the forms and the several names applied to them. The types of *Cynoglossum revolutum* R. & P. and *C. parviflorum* Krause, came from central Peru in the western part of the Department of Junin. The type of *C. andicolum* Krause was obtained in northern Peru in the Department of Cajamarca. The genus *Hackelia* is also represented in the Andes of the Department of Lima whence it has been reported by Brand. The material I have cited from the Department of Cusco

I assume, on phytogeographical grounds, to be similar to that from the departments of Lima and Junin and these latter hence different from the plant of Colombia and Ecuador.

To my knowledge the genus has been reported from only two localities in Bolivia. Perkins, Engler Jahrb. xlix. 214 (1912), cites a collection from the Department of La Paz. Fiebrig made numerous collections at Calderillo in southern Bolivia, one of these being the type of *C. Fiebrigii* Krause. The collection by Fiebrig seems clearly conspecific with the material that I cite from Cusco.

From Argentina Brand cites collections from the provinces of La Rioja and Tucaman. The type of *C. ovatifolium* Griseb. came from Tucaman. The collections I cite from Catamarca are very slender and have lanceolate leaves and small flowers and perhaps are not referable to Grisebach's species.

15. **Selkirkia** Hemsley.

Calyx cut to base. Corolla with tube short-cylindrical; lobes rounded, imbricate; throat with broad-trapeziform intruded appendages; stamens included; filaments slender, filiform, short, attached at middle of tube; anthers oblong, about equalling the filaments. Style slender, scarcely surpassing the nutlets; stigma capitate. Ovules 4. Nutlets 4, winged-margined, with subulate glochidiate appendages dorsally, attached ventrally by a broad medial areola to a pyramidal gynobase.—Shrub. Leaves alternate, firm. Flowers in naked racemes more or less corymbosely disposed. Pedicels slender, erect in fruit.—Bot. Challenger i. pt. 3, 47 (1884).

A monotypic genus very closely related to *Hackelia* and perhaps best treated as a subgenus of it. It is separated from *Hackelia* by no structural characters, differing only in its fruticose habit, firmer foliage, erect fruiting pedicels and more or less corymbose inflorescence. Certainly *Selkirkia* is less distinct from *Hackelia* than are the species of *Eritrichium* which Brand, Fedde's Repert. xxii. 104 (1925), has recently, I believe improperly, referred to the genus. On the Juan Fernandez Islands, as on other oceanic islands, various genera, prevailingly herbaceous on the continent, have developed species that are decided shrubs. No one gives generic rank to the woody insular forms of *Chenopodium*, *Plantago* and *Erigeron* on the Juan Fernandez Islands and I question the advisability of doing so with the present insular shrubby manifestation of *Hackelia*. To those who doubt the close relationship of *Hackelia* and *Selkirkia* I commend a study and comparison of the plate of *Selkirkia* given by Hemsley, l. c., and that of *Hackelia floribunda* given by Hooker, Fl. Bor. Am. ii. t. 164 (1838).

1. **Selkirkia Berteri** (Colla) Hemsley. Shrub 1–2 m. tall; branches densely canescent-strigose, becoming glabrate, leafy on only the outermost decimeter, older parts roughened by leaf-scars; leaves oblanceolate or obovate-oblanceolate, somewhat acuminate, contracted towards the base into a winged petiole ca. 5 mm. long, the blade 4–9 cm. long, 1–3 cm. broad, paler beneath, very sparsely strigose, becoming glabrous in age but minutely roughened by the persistent tubercular bases of the hairs, midrib conspicuous, veins very obscure; inflorescence a corymbose panicle, bracted only in the lower part, 6–10 cm. tall and about as thick, branches with slightly spreading pubescence; calyx strigose, the lobes ovate, imbricate, acute, ca. 1 mm. long in flower and almost 2 mm. long in fruit; pedicels slender, ascending, 5–10 mm. long; corolla white with a spreading limb 8–9 mm. long; corolla-tube 2.5–3 mm. long, 2.5 mm. thick, glabrous inside; throat open; lobes orbicular, a little longer than the tube; nutlets ca. 4 mm. long, the body compressed ovate with a broad coarsely and irregularly lobed margin, dorsally bearing several coarse compressed subulate appendages which are sparsely and weakly glochidiate at tip, surface glabrous or very sparsely strigose, anterior face with a large flat triangular scar; style shortly but clearly surpassing the body of the nutlets.—Bot. Challenger i. pt. 3, 48, t. 57 (1884); Ph. Anal. Univ. Chile xc. 554 (1895); Johow, Estud. Fl. Juan Fernandez 84 (1896); Reiche, Anal. Univ. Chile cxxi. 250 (1907) and Fl. Chile v. 208 (1910); Skottsb. Nat. Hist. Juan Fernandez ii. 163 (1921); Brand, Pflanzenr. iv. Fam. 252, i. 16 and 163 (1921); Johnston, Contr. Gray Herb. lxx. 45 (1924). *Cynoglossum Berteri* Colla, Mem. Acad. Torino xxxviii. 132, t. 43 (1834); DC. Prodr. x. 153 (1846); Clos in Gay, Fl. Chile iv. 478 (1849).

CHILE: Portezuelo de Villagra, Masatierra, *Skottsberg 132* (US); Juan Fernandez, *Downton* (G); Juan Fernandez, Oct. 1872, *Reed* (MS); Juan Fernandez, Nov. 1864, *Philippi* (MS); Masatierra, 1892, *Johow* (IP).

The plant is known only from Masatierra Island of the Juan Fernandez group.

IV. Tribe Cynoglosseae.

Nutlets ascending or divergent or rarely even inverted or suberect, straight or slightly bent, appendaged or verrucose or smooth, usually margined; areola lateral to apical, near the radicle, unmargined, not strophiolate; gynobase flat pyramidal or columnar; style entire; stigma 1, capitate; corolla blue or white.—Johnston, Contr. Gray Herb. lxxiii. 69 (1924); Brand, Pflanzenr. iv. Fam. 252, i. 2 (1921).

KEY TO GENERA.

Nutlets with glochidiate appendages; perennials or biennials with alternate leaves, lower leaves stalked; inflorescence bractless or bracted only at the base.....16. *Cynoglossum.*
Nutlets with uncinately tipped appendages; annuals with the lower leaves opposite and unstalked; inflorescence bracted throughout.....17. *Pectocarya.*

16. **Cynoglossum** [Tournef.] L.

Calyx cut to beyond the middle, somewhat accrescent at maturity and spreading or reflexed. Corolla cylindrical or funnelform; lobes broad, spreading, imbricate; throat with trapeziform oblong or sublunate appendages; stamens included, affixed in the tube; filaments short; anthers oblong or elliptical. Ovules 4. Nutlets 4, depressed-ovoid or orbicular, glochidiate, ascending or divaricate, back flat or convex, frequently with an elevated margin, attached by a small or large medial to apical scar to a convex or pyramidal gynobase and frequently with a free subulate prolongation decurrent on the short entire style.—Biennial or perennial or rarely annual. Leaves alternate, the basal ones long-stalked. Racemes elongating, usually ebracteate, rarely bracted at the base.—Sp. Pl. 134 (1753); Gen. Pl. 65 (1754).

A cosmopolitan genus of about 50 species of which about 8 are indigenous to America.

KEY TO SPECIES.

Attachment-scar of nutlets with a free slender apical prolongation decurrent on the style; coarse introduced biennials.
Nutlets 4–5.5 mm. long, papillate between the glochidiate appendages; corolla ca. 1 cm. broad, conspicuously veiny; upper leaves amplexicaul.....1. *C. creticum.*
Nutlets 2.5–3 mm. long, smooth between the glochidiate appendages; corolla ca. 0.5 cm. broad, very obscurely veined; upper leaves not amplexicaul.....2. *C. zeylanicum.*
Attachment-scar not prolonged apically nor decurrent on the style; indigenous species.
Nutlets very widely spreading or divaricate, attachment-scar subapical and small; mature pedicels 1 cm. long or less; leaves obviously nerved; Chile.....3. *C. limense.*
Nutlets ascending, attachment-scar occupying most of the ventral face, mature pedicels 0.8–3 cm. long; leaves inconspicuously if at all nerved.
Nutlets 2–2.6 mm. long; corolla 7–12 mm. broad; leaves usually sparsely villous-strigose above, larger ones 6–12 cm. long; plant fruticulose below; Chile....4. *C. paniculatum.*
Nutlets ca. 6 mm. long; corolla 5–6 mm. broad; leaves glabrous above except near margins, larger ones 10–20 cm. long; plant herbaceous to base; Colombia and Ecuador.....5. *C. Trianaeum.*

1. **Cynoglossum creticum** Mill. Biennial; stems coarse, erect, solitary, simple, 3–7 dm. tall, densely pilose; leaves pilose, somewhat canescent; lower leaves oblanceolate, 10–18 cm. long, 2–4 cm. broad, gradually contracted below into winged stalks, obtusish; middle and upper leaves gradually reduced up the stem, lanceolate or oblong, with broad rounded sessile amplexicaul bases; racemes solitary or geminate, 5–20 cm. long, disposed eventually into a loose few-branched panicle, bractless or bracted only at the base; calyx appressed-pilose, cut to near the base into broadly lanceolate or oblong lobes, 3–4 mm. long at anthesis, at maturity widely spreading and 5–9 mm. long; pedicels slender, 6–10 mm. long, recurving; corolla violet, evidently veined, broadly funnelform, 7–9 mm. long, limb 9–11 mm. broad; nutlets ovate-orbicular, depressed, 4–5.5 mm. long, unmargined, covered with glochidiate appendages and papillae, divaricate, the attachment-scar small, circular with a linear prolongation decurrent on the style; style 3–4 mm. long.—Gard. Dict. ed. 8 (1768); Brand, Pflanzenr. iv. Fam. 252, i. 129 (1921); Johnston, Contr. Gray Herb. lxx. 33 (1924). *C. pictum* Soland. in Aiton, Hort. Kew. i. 179 (1789); Reiche, Anal. Univ. Chile cxxi. 248 (1907) and Fl. Chile v. 206 (1910). *C. molle* Ph. Linnaea xxix. 18 (1857); Ph. Anal. Univ. Chile xc. 552 (1895).

ARGENTINA. Buenos Aires: Cerro Redondo, Sierra Baya, Nov. 11, 1924, *Castellanos* (G).

CHILE. Valdivia: Cuesta de Sote, *collector not given* (MS). Arauca: Canete, 1909, *Tzschalran* (IP); Contulmo, 1909, *Johow* (IP). Concepcion: Tomé, Nov. 1855, *Germain* (MS, type of *C. molle;* G, photo.); San Vicente, 1924, *Looser* (Looser Herb.). Ñuble: Chillan, Dec. 1869, *Reed* (G); between Chillan and Baños, Jan. 1877, *Philippi* (MS); Ñuble, 1878, *Puga* (MS); Valle del Renegada, Jan. 1877, *Philippi* (MS). Talca: Talca, Oct. 1921, *Claude-Joseph 1685* (US). Santiago: San Juan de Pirque, 1914, *Baeza* (IP); San José de Maipo, 1911, *Johow* (IP); Puente Alto, 1923, *Baeza* (IP); El Volcan, 1925, *Looser* (Looser Herb.); El Manzano, 1925, *Looser* (Looser Herb.); Santiago, Nov. 1924, *Claude-Joseph* 2868 (US).

A native of the Mediterranean region well established and a pest in the fields of central Chile. It is also to be reported from eastern Argentina, where it has apparently appeared only recently for I can find no report of the occurrence of an introduced *Cynoglossum* in that country. In Chile, where it is well known under the name "trupa," it was first mistaken for an indigenous plant and described as *C. molle* by Philippi. Some of the material I have examined has been mistaken for *C. officinale* L., another species of the Old World, which is to be expected as an introduction in South America. It is similar to *C. creticum* but differs in having the back of the nutlets depressed, margined, and lacking any papillae between the glochidiate appendages, also in having the corolla obscurely rather than conspicuously veined and the upper cauline leaves not amplexicaul.

2. **C. zeylanicum** Thunb. Biennial; stems erect, simple or loosely branched above, 3–8 dm. tall, strigose (towards the base retrorsely so); leaves evidently veiny, densely strigose, usually somewhat cinerescent; lower leaves oblanceolate, 1–2 dm. long, 2–4 cm. broad, gradually contracted to a narrowly winged stalk; middle cauline leaves elliptic or lance-elliptic, sessile by a rounded or deltoid base, 4–6 cm. long, 1–2 cm. broad, reduced up the stem; racemes geminate, disposed in a loose panicle, bractless, unilateral, 5–15 cm. long; calyx densely strigose, cut below the middle into obtuse ovate or deltoid lobes, at anthesis ca. 2 mm. long, slightly accrescent at maturity becoming 3–3.5 mm. long and widely spreading; pedicels 2–5 mm. long, recurving; corolla blue, broadly funnelform, 4–5 mm. long, limb concave and ca. 5 mm. broad; nutlets ovate, compressed, 2.5–3 mm. long, unmargined, divaricate; attachment-scar narrowly ovate, subapical with a linear prolongation decurrent on the style; style 2–3 mm. long.—Thunb. ex. Lehm. Neue Schrift. Nat. Gess. Halle iii. pt. 2, 20 (1817) and Asperif. i. 116 (1818); Brand, Pflanzenr. iv. Fam. 252, i. 134 (1921); Johnston, Contr. Gray Herb. lxx. 33 (1924). *C. furcatum* Wall. in Roxb. Fl. Ind. ii. 6 (1824).

CHILE. VALDIVIA: Valdivia, 1899, *Buchtien* (US). INDEFINITE: "San Juan der Muhle," Feb. 1891, *Philippi* (MS).

A species of southeastern Asia introduced in southern Chile. Brand, l. c., cites "*Anchusa zeylanica* Vahl" of Hornemann, Enum. Hafn. 3 (1807) and Hort. Hafn. i. 176 (1813), as the name-bringing synonym for *C. zeylanicum*. Lehmann, however, in publishing *Cynoglossum zeylanicum* (in the synonymy of *Echinospermum zeylanicum* Lehm.) definitely excludes the references to Hornemann's works just cited, cf. Asperif. i. 116 and 217 (1818). The notes by Jacquin, Ecol. Pl. i. 47 and 152 (1811–16) and Lehmann, l. c., would indicate that the plant Hornemann had in mind was a species of *Bothriospermum* and not a *Cynoglossum*. In any case "*Anchusa zeylanica* Vahl" of Hornemann merits no recognition since it is a *nomen subnudum* and was published only incidentally in the discussion of another species.

3. **C. limense** Willd. Perennial (?); stems several, lax, strigose, simple or sometimes erectly branched, 3–6 dm. tall; leaves veined, lanceolate to lance-oblong, acute, 5–12 cm. long, 9–30 mm. broad, pale below and strigose, green above and finely strigose; upper leaves sessile by a triangular or rounded base; lower leaves larger and gradually contracted into a winged stalk; racemes geminate and solitary, 5–10 cm. long, unilateral, bractless; calyx 3 mm. long at anthesis, campanulate, cut to about middle into rounded lobes, in fruit ac-

crescent with oblong to lance-linear stellately spreading lobes 5–7 mm. long; pedicels recurved, slender, 3–10 mm. long; corolla 7–10 mm. long, pale blue becoming cream-colored or brownish in drying, limb concave 7–10 mm. broad, lobes obovate, tube 2–3 mm. long and broadly cylindrical, throat with intruded trapeziform appendages that have decurrent hairy bases; stamens attached at middle of tube with the anthers oblong ca. 1.3 mm. long and longer than the filaments; nutlets compressed, ovate-orbicular, unrimmed, 2.5–3 mm. long, divaricate or slightly ascending, attachment-scar small circular and subapical; style 2–3 mm. long.—Sp. Pl. i. 762 (1798); Lehm. Asperif. i. 177 (1818); Brand, Pflanzenr. iv. Fam. 252, i. 142 (1921); Johnston, Contr. Gray Herb. lxx. 33 (1924) and l. c. lxxiii. 77 (1924). *C. decurrens*, var. *limense* A. DC. Prodr. x. 153 (1846). *C. decurrens* R. & P. Fl. Peruv. ii. 6 (1799); Lehm. l. c. 142; H. & A. Bot. Beechey Voy. 37 (1830); A. DC. l. c.; Clos in Gay, Fl. Chile iv. 479 (1849); Reiche, Anal. Univ. Chile cxxi. 249 (1907) and Fl. Chile v. 207 (1910). *C. alatum* Mol. Sagg. Chile ed. 2, 280 (1810).

CHILE. CONCEPCION: vicinity of Concepcion, 1855, *Germain* (G). VALDIVIA: woods near Arique, Nov., *Lechler 321* (MS); Niebla, *collector not given, no. 286* (MS). LLANQUIHUE: shore of Rio Puelo, carrera del Barraco, Jan. 18, 1872, *Fellez* (MS). INDEFINITE: "Concepcion, Valdivia," *collector not given* (US).

The name *C. limensis* Willd. is based upon a plate and description given by Feuillée, Jour. Obs. Phys. ii. 765, t. 49 (1714). According to Feuillée he found the plant at Ilo, a minor part on the desert coast of southernmost Peru. No true species of *Cynoglossum* is known from Peru or northern Chile and it seems more than probable that Feuillée obtained his specimens at Concepcion, where he found many of the plants that he reports, and that through some confusion of data he incorrectly attributed the plant to Peru. Certainly the original plate and description apply very well to the plant that has been collected at Concepcion and that which has been current as *C. decurrens* R. & P.

I doubtfully refer to *C. limense* two peculiar collections I saw in the herbaria of the Museo Nacional and Instituto Pedagógico at Santiago. Both these collections are from the vicinity of Concepcion, Chile, one collected in Nov. 1855 at Tomé by Germain, and the other at Cerro Caracol in 1921 by Baeza. Both differ from the collections which I have unreservedly referred to *C. limense* in having spreading pubescence rather than appressed, and in having smaller more acute calyx-lobes. Germain's collection is most peculiar since it has the corollas only 3–4 mm. long, the calyces scarcely accrescent and only 3.5 mm. long in fruit, the mature pedicels only 1–3 mm. long and the

ripe nutlets ca. 2.5 mm. long. Baeza's collection, however, has corollas and fruit of typical *C. limense*. It is clear that these forms do not represent typical forms of the species but more material must be available for study before it would be wise to attempt to define the forms or give them nomenclatorial recognition.

4. **C. paniculatum** H. & A. A weak perennial, in age becoming somewhat fruticulose below and producing a few erect subsimple branches 2–8 dm. long, strigose or merely appressed hispid-villous; leaves oblanceolate, acute, 5–12 cm. long, 1–2 cm. broad, gradually and but little reduced up the stem, contracted gradually towards the point of attachment, usually veinless, margins sparsely ciliate, lower surface pale and strigose, the upper sparsely short villous-strigose, lower leaves with a short narrow petiole, the upper sessile by a subulate base; inflorescence a very loose open panicle, 1–3 dm. long, leafy-bracted towards the base; calyx 1.5–2 mm. long, densely strigose, cut to below middle into deltoid or short-lanceolate lobes, scarcely accrescent in age and strongly reflexed; pedicels slender, divaricate, straight, 0.8–3 cm. long; corolla funnelform, ca. 5 mm. long, light blue; limb concave, 5–6 mm. broad, lobes obovate and 2.5–3 mm. long; tube cylindrical, 1.5 mm. long, about equalling the calyx; faucal appendages trapeziform, pubescent; stamens affixed at middle of tube; anthers elliptic, ca. 0.5 mm. long, about twice as long as the filaments; nutlets orbicular-ovate, ascending, 2–2.6 mm. long, unmargined, attachment-scar occupying most of the ventral face; gynobase pyramidal; style 1.5–2 mm. long.—Bot. Beechey Voy. 37 (1830); DC. Prodr. x. 153 (1846); Clos in Gay, Fl. Chile iv. 478 (1849); Reiche, Anal. Univ. Chile cxxi. 248 (1907) and Fl. Chile v. 206 (1910); Brand, Pflanzenr. iv. Fam. 252, i. 137 (1921); Johnston, Contr. Gray Herb. lxx. 33 (1924). *C. Azocarti* Ph. Anal. Univ. Chile lxv. 62 (1884) and l. c. xc. 553 (1895). *C. paniculatum*, var. *Azocarti* Reiche, l. c. *C. paniculatum*, f. *Azocarti* Brand, l. c. *C. paniculatum*, f. *Philippianum* Brand, l. c.

CHILE. VALDIVIA: thickets, San Juan, Dec., *Philippi* (MS). MALLECO: Las Viñas, 1915, *Baeza* (IP); Araucania, Nov. 1887, *Philippi* (MS). CONCEPCION: Concepcion, *Philippi* (MS). MAULE: Constitucion, 1880–1, *Azocart* (MS, TYPE of *C. Azocarti;* G, photo.). TALCA: Talca, Oct. 1922, *Claude-Joseph 2071* (US). VALPARAISO: Curauma, Oct. 1883, *Philippi* (MS); Valparaiso, Oct. 1925, *Claude-Joseph 3670* (US); La Palma near Quillota, *Bertero 1161* (G). INDEFINITE: Nahuelnuta, April 1877, *Reed* (G).

A very distinct species which though apparently uncommon is widely distributed over south-central Chile. It is best known from the coastal hills of the province of Valparaiso. In addition to the localities I have listed, Brand, l. c., cites collections of Poeppig from

Concon and Chorrillos. The type came from Concepcion. In describing the species Hooker & Arnott mention a collection made by Macrae at "Murillo Bay in Peru" referring perhaps to an unimportant locality in the department of Arequipa. I do not believe that *C. paniculatum* grows in Peru and suspect that the record is the result of a misdetermination or, very much more likely, confused locality-data. The plant from Constitucion named *C. Azocarti* by Philippi is worthy of no nomenclatorial recognition. The leaves in the type-specimen are very loosely though strongly revolute. This condition is clearly the result of insufficient pressure during the preparation of the specimens. Though the revolute leaves appear very narrow, in fact their real breadth is not unusually small for the species.

5. **C. Trianaeum** Wedd. Perennial or biennial; stems several, erect, simple, 3–8 dm. tall, glabrous below, villous-strigose above; leaves acute or acuminate, contracted gradually towards the base, oblanceolate, firm, conspicuously bicolored, beneath pale and abundantly hispid-strigose, above shiny and (margins excepted) glabrous; lower leaves 1–2 dm. long, contracted to an alate stalk 1–2.5 cm. long and 4–5 mm. broad; upper leaves contracted to a narrow sessile base, gradually reduced up the stem; base of leaves ciliate, slightly broadened, somewhat clasping and decurrent forming angles on the stem; racemes solitary, terminal, becoming very loose and 1.5 dm. long, bractless above but near base leafy-bracted; calyx at anthesis broadly campanulate, ca. 4 mm. long, cut to about the middle into broad teeth, densely strigose; calyx in fruit reflexed, slightly accrescent, surpassed by the nutlets; pedicels slender, ascending, 1.5–3 cm. long, usually nodding at maturity; corolla blue to violet, limb spreading, 7–12 mm. broad, lobes obovate; tube shorter than the lobes, broadly cylindrical, 2–4 mm. long; appendages trapeziform, pubescent; stamens attached at middle of tube, filaments short about equalling the length of the oblong anthers; nutlets ovate, compressed, ca. 6 mm. long, unmargined, ascending; attachment-scar very large, ovate, occupying most of the ventral face of the nutlet; gynobase pyramidal; style ca. 2 mm. long.—Chlor. Andina ii. 90 (1859); Oliver in Hook. Icones Pl. xxv. t. 2458 (1896); Brand, Pflanzenr. iv. Fam. 252, i. 136 (1921); Johnston, Contr. Gray Herb. lxx. 33 (1924).

COLOMBIA or ECUADOR: "Casapamba?", *André 2952* (NY).

A montane plant of western Colombia and Ecuador. The type came from the cordilleras of the province of Antioquia, Colombia, but apparently most of the subsequent collections have been made at the southern end of the Cordillera Central in the provinces of Nariño and

Cauca. The species is a very distinct one and is widely separated from its congeners in Mexico, California and Chile.

17. **Pectocarya** DC.

Calyx cut to base, accrescent, divaricate at maturity. Corolla tubular; lobes ascending, imbricate, small; throat with small intruded appendages; stamens included, short, attached at middle of tube; filaments short; anthers oblong or elliptical. Style very short; stigma capitate. Ovules 4. Nutlets 4, obovate to linear, divaricate, paired, usually margined, pubescent with uncinate hairs, apically affixed to a low very broadly pyramidal gynobase.—Slender spreading annual herbs with the lower leaves opposite and linear. Flowers in leafy-bracted very elongate false racemes which constitute the bulk of the plant.—DC. in Meisner, Gen. i. 279; ii. 188 (1840); Brand, Pflanzenr. iv. Fam. 252, i. 94 (1921). *Ktenospermum* Lehm. Del. Sem. Hort. Hamb. 17 (1837), nom. nudum; (*Ctenospermum*) Post & Kuntze, Lex. 152 (1904). *Gruvelia* A. DC. Prodr. x. 119 (1846).

A very distinct genus of west American herbs. In his recent treatment of the genus Brand, l. c., recognizes only 3 species, viz., *P. setosa* Gray of North America and *P. pusilla* (A. DC.) Gray and *P. lateriflora* (Lam.) DC. of both North and South America. I am convinced, however, that what he has called *P. lateriflora* is an aggregate of 7 recognizable entities which have technical fruit-characters, distinct ranges and characteristic habits of growth. I am treating the 4 of these forms which occur in South America as species, and believe that the North American forms should be treated likewise.

Key to Species.

Nutlets equally divergent, much compressed, obviously angular and rhomboidal in outline.....1. *P. pusilla.*
Nutlets divergent in pairs, thickish, not obviously angular nor rhomboidal in outline.
  Back and sides of nutlets armed with coarse subterete subulate appendages tipped with uncinate hairs.....2. *P. anomala.*
  Back of nutlets smooth or at most papillate, margin with a lacerately or pectinately cut wing-margin bearing uncinate hairs.
    Fruit dimorphic, that produced at base of plant with reflexed subpersistent nutlets obviously different from the divaricate nutlets produced by the normal fruit of the middle and upper stems.....3. *P. dimorpha.*
    Fruit of one sort, that produced at the base of the plant similar to that on the upper stem.
      Nutlets linear, 2.5–3 mm. long, sides parallel.....4. *P. gracilis.*
      Nutlets obovate or obovate-oblong.

Nutlet-body 2–2.5 mm. long, with medial dorsal ridge. 5. *P. lateriflora.*

Nutlet-body 1.5–2 mm. long, lacking medial dorsal ridge. . . . . 6. *P. boliviana.*

1. **Pectocarya pusilla** (A. DC.) Gray. Plant small and slender, strigose, with erect or ascending simple stems; leaves linear or oblong-linear, obtuse, 0.5–2 cm. long, 1–2 mm. broad, sparsely strigose; flowers all chasmogamic; corolla short salverform with ascending lobes; nutlets 4 or fewer, rhomboidal or rhomboid-obovate, homomorphous, radially arranged, 1.8–2.3 mm. long, 1.5–2 mm. broad; margin acute but wingless, ciliate with uncinate hairs.—Proc. Am. Acad. xii. 81 (1876); Reiche, Anal. Univ. Chile cxxi. 247 (1907) and Fl. Chile v. 205 (1910); Brand, Pflanzenr. iv. Fam. 252, i. 96, fig. 1g (1921); Johnston, Contr. Gray Herb. lxx. 38 (1924). *Gruvelia pusilla* A. DC. Prodr. x. 119 (1846); Clos in Gay, Fl. Chile iv. 482, t. 52 bis, fig. 3 (1849). *P. chilensis,* var. *californica* Torr. Pacif. R. R. Rep. iv. 124 (1857); Johnston, l. c. lxxv. 43 (1925). *P. pusilla,* var. *flagillaris* Brand, l. c.

CHILE. Valparaiso: dry slope, [? Punta de] La Playa Ancha, Aug. 1830, *Bertero 212* (G, NY).

This species although based upon material from central Chile seems to be very rare there. Brand, l. c., reports a collection made at Rancagua by Philippi. There are, however, no collections of the species in the Philippi Herbarium in the Museo Nacional nor in the herbarium of the Instituto Pedagógico at Santiago. In fact with the exception of the Philippi collection cited by Brand, the species is not known to have been collected in Chile for nearly a century. It is, however, well known from central and northern California where it has been frequently collected.

2. **P. anomala** Johnston. Stems slender, finely strigose, not numerous, erect or ascending; leaves filiform-linear, 1–3 cm. long, 0.7–1 mm. broad, appressed short hispid-villous; flowers all chasmogamic; corolla short salverform with ascending lobes; nutlets densely pubescent, the pubescence short soft and uncinate; body of nutlet obovate-oblong, 1.5–1.7 mm. long, ca. 0.7 mm. broad, without a proper margin, back and upper sides producing subulate subterete appendages 0.6–1 mm. long that are terminated with uncinately tipped bristles.—Contr. Gray Herb. lxx. 35 (1924).

PERU. Arequipa: sandy pampa on south slope of El Chachani, 2400 m. alt., March 1920, *Hinckley 41* (G, type); open gravelly soil above Arequipa 2500–2600 m. alt., April 1925, *Pennell 13165* (G, FM).

An extremely well marked species known only from the vicinity of Arequipa, Peru. It seems to be most related to *P. lateriflora*, but is quickly separated from that species by the lack of a definite margin on its nutlets and by the peculiar subterete subulate appendages that cover them.

3. **P. dimorpha** (Johnston), comb. nov. Stems slender but stiffish, prostrate or widely ascending, numerous, finely and closely strigose, somewhat canescent; leaves filiform-linear, 1–3 cm. long, 0.5–1 mm. broad, canescent, finely strigose and occasionally short-hispid; corolla short-salverform with ascending lobes; fruits dimorphic, those of the cleistogamic flowers (borne at the base of the stems) all reflexed and with narrow margins; nutlets of the chasmogamic flowers (borne along the stems) with body oblong or narrowly obovate-oblong, ca. 2 mm. long, 0.8–1.1 mm. broad, tending to be heteromorphous with the abaxial one or one of each opposing pair tending to be less broadly margined, slightly smaller, more pubescent and more persistent than the others; margins of the nutlets of the normal fruits very much reduced or more characteristically well developed, ascending or erect and frequently much incurved, pectinately or lacerately cleft or divided or even dentate with the lobes triangular to subulate and terminated by uncinately tipped bristles.—*P. gracilis*, var. *dimorpha* Johnston, Contr. Gray Herb. lxx. 37 (1924).

CHILE. ATACAMA: Vallenar, Oct. 1914, *Rose 19331* (US); Rio de Laguna Grande east of Vallenar, 2140 m. alt., *Johnston 5891* (G); Valle de Carrizal, Sept. 1885, *collector not given* (MS); Yerba buena, 1885, *R. Godoi de Collao* (MS); Bandurrias, 1885, *Geisse* (MS, G); Atacama Desert [? Bandurrias], *Geisse 59* (NY); Quebrada de Chanchoquin north of Copiapó, 1885, *Gigoux* (G); gravelly bench in hills north of Copiapó, 600 m. alt., *Johnston 5025* (G); Copiapó, Sept. 1885, *San Roman* (MS); Desert of Atacama [Caldera-Copiapó region!], *Morong 1282* (G, TYPE; NY, ISOTYPE). ANTOFAGASTA: a small colony on a very dry rocky hillside at western end of Llano Colorado, Dept. of Taltal, *Johnston 5656* (G).

The present plant is perhaps most related to *P. gracilis*, but is quickly distinguished by its stiffer stems, shorter more heteromorphous nutlets and presence of cleistogamous flowers at base of stem. Its range is north of that of *P. gracilis*, covering the western part of the province of Atacama and extreme southern Antofagasta. It is a very distinct species and certainly worthy of recognition.

4. **P. gracilis** (R. & P.) Johnston. Stems very slender, numerous, prostrate or widely ascending, finely and closely strigose, canescent; leaves filiform-linear or narrowly oblance-linear, 1–3(–4) cm. long, 0.6–1.5(–1.8) mm. broad, numerous, closely fine-strigose; flowers all chasmogamic; corolla short-salverform with ascending lobes; nutlets

homomorphous or only obscurely heteromorphous; nutlet-body linear-oblong or somewhat spathulate-oblong, 2.5–3 mm. long, 0.6–1 mm. broad, with the erect or strictly ascending margin pectinately parted or divided into subulate or narrowly triangular teeth each terminated by an uncinately tipped bristle.—Contr. Gray Herb. lxx. 36 (1924). *Myosotis gracilis* R. & P. Fl. Peruv. ii. 5 (1799). *Echinospermum gracile* Lehm. Asperif. i. 129 (1818). *Rochelia gracilis* R. & S. Syst. iv. 111 (1819). *Cynoglossum lineare* R. & P. l. c. 6. *P. linearis* DC. Prodr. x. 120 (1846). *P. chilensis* DC. l. c.; Clos in Gay, Fl. Chile iv. 480, t. 52 bis, fig. 2 (1849). *P. gracilis*, var. *genuina* Johnston, l. c. *P. lateriflora* of Reiche, Anal. Univ. Chile cxxi. 247 (1907) and Fl. Chile v. 205 (1910), in largest part.

ARGENTINA. Santa Cruz: fields near Rio Gallegos, March 11, 1882, *Spegazzini* (G). Rio Negro: vicinity of General Roca, 250–360 m. alt., Sept. 28, 1914, *Fischer 123* (G, US, FM); fields near Rio Negro, Nov. 19, 1904, *Berg* (G). Mendoza: Frutillo, Oct. 1913, *Sanzin* (G).

CHILE. OHiggins: Rancagua, 1878, *no collector given* (MS). Santiago: Santiago, *Claude-Joseph 684, 1496* and *2241* (US); Santiago, Sept. 1900, *Hastings 56* (US); Santiago, Sept. 1840, *Gay 1616* (MS); Cerro San Cristoral, Nov. 1854, *no collector given* (MS); San Cristoral, 1876, *no collector given* (MS); Cerro San Cristobal, Oct. 1924, *Montero 27* (G); Cerro San Cristobal, Aug. 1925, *Looser* (G); San Cristobal, 1913 and 1917, *Baeza* (IP); San Bernardo Sept. 1877, *no collector given* (MS); Santa Rita, Oct. 1879, *no collector given* (MS); Chacabuco, Sept. 1864, *no collector given* (MS); Tiltil, 1911, *Horst* (IP); Navia, 1914, *Baeza* (IP). Valparaiso: Valparaiso, Sept. 30, 1895, *Buchtien* (US); Valparaiso, 1856, *Harvey* (G); Concon, *Poeppig* (NY). Aconcagua: San Felipe, Aug. 1921, *Claude-Joseph 1351* (US); Zapillar, 1912, *Horst* (IP); Palquico, Oct. 4, 1914, *Rose 19189* in pt. (US). Coquimbo: vicinity of Illapel, Oct. 7, 1914, *Rose 19269* (US); La Cumbre, Oct. 15, 1914, *Rose 19349* (US); Coquimbo, Sept. 1885, *no collector given* (MS). Atacama: Rio Laguna Grande east of Vallenar, 2140 m. alt., *Johnston 6283* (G). Indefinite: locality not given, Aug. 9, 1917, *Skottsberg 722* (G); locality not given, *Bridges* (G); locality not given, *Bertero 211* (G, NY).

The species concerned here is the common one of central Chile. It is certainly *Cynoglossum lineare* R. & P., the type of which came from Santiago (Sancti Jacobi), where the present species is common. The type of *Myosotis gracilis* R. & P. is said to have come from Concepcion. Although Reiche gives the range of the plant as south to the province of Bio-Bio, I have not seen any collections from south of OHiggins.

In Argentina the species seems to be uncommon. Brand and Dusén report it from Rawson, Chabut. Spegazzini cites four localities in Santa Cruz, viz. Rio Gallegos, Rio Santa Cruz, San Julian and Rio Deseado. A Pectocarya cited by Brand from La Incrucijada, La Rioja, may represent the present species but from phytogeographical considerations would seem to be more probably *P. boliviana*.

Outside its range in central Chile and southern Argentina the species also occurs in southern California. It has a definite character and is quickly recognized by its very elongate linear nutlets. The subulate toothing of the nutlets in this species, more than in any other, merits the adjective "pectinate."

5. **P. lateriflora** (Lam.) DC. Stems ascending or erect, not very numerous, stiffish, finely appressed hispid-villous or strigose; leaves filiform-linear to narrowly lance-linear or linear-lanceolate, 1–5 mm. long, 1–2.5 mm. broad, usually definitely contracted towards both ends, appressed hispid-villous and usually somewhat canescent; flowers all chasmogamic; corolla short-salverform with ascending lobes; nutlets tending to be heteromorphous with the abaxial one usually more pubescent and roughened than the other ones which commonly are smooth and glabrate or sparsely pubescent; nutlet-body obovate or obovate-oblong, 2–2.5 mm. long, 1–1.8 mm. broad, with a definite medial dorsal ridge, margin becoming well developed spreading, pectinately and lacerately cleft or divided into subulate or narrowly triangular teeth terminated by uncinately tipped bristles.—Prodr. x. 120 (1846); Brand, Pflanzenr. iv. 252, i. 95 (1921); Johnston, Contr. Gray Herb. lxx. 35 (1924) and l. c. lxxiii. 76 (1924). *Cynoglossum lateriflorum* Lam. Encyc. ii. 239 (1786) and Planch. t. 92, fig. 2 (1791); Lehm. Asperif. i. 166 (1818). *Mattia lateriflorum* Don, Gen. Syst. iv. 310 (1838). *Rindera lateriflora* R. & S. [Syst. iv. 762 (1819)] ex Steud. Nom. Bot. ed. 2, ii. 460 (1841). *C. pilosum* R. & P. Fl. Peruv. ii. 6, t. 111b (1799); Lehm. l. c. 167. *M. pilosa* Don, l. c. *R. pilosa* R. & S. [l. c.] ex Steud. l. c. (?) *Ktenospermum linifolium* Lehm. Linnaea xii. Litt. 84 (1838), nom. nudum.

PERU. LIMA: open rocky hill, Amancaes, 200–400 m. alt., *Pennell 14806* (G, FM); open sandy slope, Atocongo, 300–500 m. alt., *Pennell 14791* (G, FM); open grassy knolls, Canta, 2800–2900 m. alt., *Pennell 14583* (G, FM); Obrajillo, *Wilkes Exped.* (G, US); loose stony soil, Rio Blanco, 3600 m. alt., *Macbride & Featherstone 675* (G, FM); rocky hillside, San Geronimo, Lima, 150 m. alt., *Macbride 5907* (G, FM); mountains near Chosica, 1700 m. alt., *Weberbauer 5330* (FM). AREQUIPA: fertile belt in hills back of Mollendo, *Johnston 3534* (G); sandy slopes, desert hills, Mollendo, *Hitchcock 22382* (US). MOQUEGUA: open mixed formation, Torata, 2200–2300 m. alt., *Weberbauer 7396* (FM).

Characterized by its obovate definitely margined nutlets and comparatively coarse stems and leaves. It is a plant of the lomas and desert margins of western Peru. Brand reports a collection of Spruce's, no. 5309, from the Andes of Ecuador. Whether this northern collection represents the species, as here defined, I do not know.

6. **P. boliviana** (Johnston), comb. nov. Stem slender, decumbent or ascending, finely and closely strigose, canescent; leaves linear-filiform to linear, 1–3 cm. long, 0.8–1.5 mm. broad, strigose, canescent; flowers all chasmogamic; corolla short-salverform with ascending lobes; nutlets heteromorphous with the abaxial one usually slightly the most roughened and pubescent; nutlet-body obovate-oblong, without a medial ridge, 1.5–2 mm. long, the spreading margin pectinately divided into numerous juxtaposed or more commonly few distant subulate teeth which are tipped by uncinate bristles.—*P. gracilis*, var. *boliviana* Johnston, Contr. Gray Herb. lxx. 37 (1924) and l. c. lxxiii. 76 (1924).

BOLIVIA. Potosi: Chiguana, 3700 m. alt., *Asplund 3897* (US, type); Atocha, 3700 m. alt., *Asplund 5896* (US). Oruro: Challapata, 3900 m. alt., *Asplund 5895* (US). La Paz: General Campero, 4200 m. alt., *Asplund 5894* (US).

This species is closely related to *P. lateriflora* of western Peru, but is a smaller and more slender plant of the puna. Its nutlets are smaller, transversely rugose, lack a definite medial dorsal ridge and have a margin that is commonly much dissected and frequently represented only by several distant subulate teeth. Brand, Pflanzenr. iv. Fam. 252, i. 95 (1921), reports *P. lateriflora* from Incrucijada in La Rioja, Argentina, upon the basis of a collection by Hieronymus & Niederlein (no. 466). This collection may represent *P. boliviana*.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXIX.

M. L. Fernald

I. GEOCAULON, A NEW GENUS OF THE SANTALACEAE

Ever since I first met *Comandra livida* Richardson, in 1894, I have had a strong conviction that it is out of place in the genus *Comandra* Nutt. Many times subsequently in the field, as I have gathered the juicy scarlet false-drupes from the filiform axillary peduncles or have examined the bronze or green, often unisexual, flowers, I have made a mental protest against the inclusion of this plant of the moss and damp humus in the same genus with *Comandra umbellata* (L.) Nutt. or with *C. elegans* (Rochel) Reichenb. f. Finally, in August, 1923, with the intention of settling the question, an abundant series of inflorescences was collected on the Shickshock Mountains; but not until the present time have they been closely studied. It now becomes quite clear that in essentially all its characters *C. livida* departs from all the species of *Comandra* proper: *C. umbellata* (L.) Nutt., *C. Richardsiana* Fernald, *C. pallida* A.DC., *C. elegans* (Rochel) Reichenb. f., *C. californica* Eastw., and perhaps others.

In true *Comandra* the stoutish creeping or sprawling superficial or subterranean stems or rootstocks are covered with a loose and freely exfoliating corky to papery whitish-brown cortex; in *C. livida* the very slender and cord-like reddish to dark-brown subterranean stems have a tight and smooth cortex. In true *Comandra* the inflorescences are terminal panicles or corymbs of numerous small umbels, each umbel subtended by a tardily deciduous or persistent foliaceous involucel; in *C. livida* the 1–3 simple mostly 3-flowered umbels are borne on

filiform peduncles from the axils of the middle leaves, and the brown, scarious involucres are caducous. The flowers of true *Comandra* are perfect, the calyx-tube free from the summit of the ovary and in fruit slightly prolonged as a neck; and the ascending turbinate limb consists of petaloid whitish lobes. The flowers of *C. livida* are androdioeceous, the central 1 (rarely 2) perfect, the lateral mostly staminate and promptly dropping after anthesis, or sometimes all the flowers staminate; the calyx-tube is completely adnate to the ovary, not prolonged above it, and the rotate limb consists of bronze or green herbaceous lobes. In true *Comandra* the elongate disk is shallowly lobed, its lobes much shorter than the filaments, and it reaches the summit of the prolonged tube; in *C. livida* the salverform disk arises from the base of the throat and its long lobes about equal the filaments. In true *Comandra* the style is filiform and prolonged; in *C. livida* conical and very short. Finally, the fruit of true *Comandra* is a dry nut with only the lower half or two-thirds of the coriaceous calyx-tube adherent to it, the upper portion forming a free neck below the erect lobes; in *C. livida* the fruit is a scarlet and juicy false-drupe, with the succulent calyx-tube completely surrounding the nut.

Differing in every fundamental character (of rootstock, flowering habit, involucre, fertility of flowers, shape and texture of perianth, adnation of tube, position and lobing of disk, form and length of style, and, above all, in the very different fruit), and restricted to the Hudsonian to arctic-alpine regions of North America, *Comandra livida* does not seem to be congeneric with the species of true *Comandra*, plants of more southern range in America, with an isolated species in southeastern Europe.

In many characters *Comandra livida* is much closer to the monotypic *Nestronia* (or *Darbya*) of the southeastern United States. Like staminate *Nestronia umbellula* Raf., *Comandra livida* has the simple few-flowered umbels on filiform axillary peduncles, borne always below the terminal leaves, the involucral bracts caducous (in all material of *Nestronia* examined completely absent), and the calyx herbaceous and with spreading limb. The pistillate or perfect flower of *Nestronia*, like that of *Comandra livida*, has the ovary quite inferior and ripening into a false-drupe with completely adnate calyx-tube. But in many characters *Comandra livida* departs from *Nestronia*. The latter is a branching shrub, with opposite leaves; *C. livida* at most suffruticose, with simple herbaceous flowering stems and

alternate leaves. *Nestronia* is dioecious or polygamo-dioecious, the pistillate flowers solitary (not umbellate) and with the limb a mere crown; *C. livida* with the perfect flower central in the umbel with the staminate and with a spreading limb. In *Nestronia* the calyx-lobes are normally 4, in *C. livida* 5; in *Nestronia* the calyx-tube of the staminate flower is elongate and lined by the elongate, shallowly lobed or undulate disk; in *C. livida* short-campanulate or salverform, with the lobes of the disk prolonged.

It is thus clear that in some of its technical characters *Comandra livida* is nearer *Nestronia* than it is to *Comandra;* yet it is not satisfactorily placed with either. It is, therefore, here proposed as

Geocaulon (*Santalaceae*), gen. nov. Flores andro-dioici, centrales plerumque hermaphroditi, laterales masculi. Calyces herbacei, priores et masculi inferne turbinato, feminei campanulati; lobis ovato-acutis, aeneis vel viridibus, patentibus persistentibusque. Fasciculus pilorum e basi interna lobi cujusve ad antheram tendens ubique adhaerens. Stamina lobis opposita, filamento subulato, anthera ovoidea, biloculari. Discus epigynus hypocrateriformis, lobis elongatis filamenta subaequantibus. Ovarium inferum, tubo calycis inclusum. Stylus conicus, brevis. Stigma capitellatum. Drupa ovoideo-globosa coccinea, vestigiis loborum et disci coronata.—Fruticulus caulibus sarmentiformibus, valde repentibus, brunneis vel rufescentibus; ramis floriferis erectis; foliis alternis integris; umbella solitaria axillaris pedunculata 3 (2–4)-flora; bracteis involucri scariosis brunneis caducis; floribus masculis caducis. (Γῆ, *earth*, and καύλος, *stalk*, from the long, slightly subterranean but scarcely modified stems.)—A single species.

G. lividum (Richardson), n. comb. *Comandra livida* Richardson in Frankl. Narr. 1st Journ. App. 734 (1823).—Creeping stems very slender, 1.5–3 mm. thick, with close smooth cortex; flowering stems 0.7–3 dm. high: leaves flaccid, grayish-green to purplish, elliptic to narrowly obovate, 1.5–5 cm. long: peduncles 1–3, filiform, in fruit 1–2 cm. long: limb of perianth about 4 mm. broad: drupes solitary (rarely 2), 6–10 mm. in diameter, with juicy pulp; the stone (or nut) thin-walled, with a very fleshy and oily edible kernel.—Creeping in moss or damp humus, Labrador to Alaska, south to southern New Brunswick, eastern Maine, mountains of northern New England, northern Michigan, northern Minnesota, Saskatchewan, Alberta and British Columbia. Fl. late May–early August; fr. July–September. The following, selected from many specimens, are characteristic. LABRADOR: Makkovik, *Stecker*, no. 99; Hopedale, *Bowdoin College Exped.* no. 245; Square Island, 1864, *B. P. Mann;* Chateau Bay, *Bowdoin College Exped.* no. 75; Forteau, *Fernald & Wiegand*, no. 3284. NEWFOUNDLAND: Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,113; Mistaken Cove, *Wiegand, Pease, Long & Hotchkiss*, no. 28,112; Brig Bay, *Fernald, Long & Dunbar*,

no. 26,610; Deer Pond, *Wiegand, Gilbert & Hotchkiss*, no. 28,114; Port Saunders, *Fernald & Wiegand*, no. 3283; Bay of Islands, *Eames & Godfrey*, no. 6037; Sandy Lake, *Fernald & Wiegand*, no. 3282; Grand Falls, *Fernald, Wiegand, Bartram & Darlington*, nos. 5327, 5328; Tilt Cove, *Fernald & Wiegand*, no. 5331; St. John's, *Robinson & Schrenk*, no. 152. QUEBEC: Archipel du Petit Mécatina, *St. John*, no. 90,397; Ile à la Proie, Archipel de Mingan, *Victorin & Rolland*, nos. 18,506, 22,055; Baie Sainte-Claire, Anticosti, *Victorin*, no. 4270; Seven Islands, *C. B. Robinson*, no. 731; La Péninsule, Baie de Gaspé, *Victorin et al.* no. 17,331; Tabletop Mts., Gaspé Co., *Fernald, Dodge & Smith*, no. 25,713; New Carlisle, 1902, *Williams & Fernald;* Lac Saint-Jean, *Victorin*, no. 15,754; Tadousac, 1892, *Kennedy;* Rivière du Loup, *Victorin*, no. 134; St. Alexandre de Kamouraska, 1880, *Pringle;* Black Lake, *Fernald & Jackson*, no. 12,077. MAGDALEN ISLANDS: Brion Island, *St. John*, no. 1851. NEW BRUNSWICK: St. John, 1872, *T. P. James*. MAINE: Mt. Katahdin, 1900, *Fernald;* Mt. Saddleback, Franklin Co., 1894, *Fernald*, 1902, *Knowlton;* Mt. Abraham, *Knowlton*, no. 606; West Quoddy Head, Lubec, *Fernald*, no. 1715; Roque Bluffs, 1913, *Knowlton*. NEW HAMPSHIRE: Mt. Clinton, *Eggleston*, no. 2399, *Pease*, no. 12,303; Imp Mt., *Pease*, no. 16,766; Mt. Ingalls, *A. H. Moore*, no. 4096, *Pease*, no. 11,210. VERMONT: Mt. Mansfield, *Pringle et al.* ONTARIO: Pic River, *Loring;* Anvil Lake, Timagami Region, *Anderson & Anderson*, no. 26,100 B. MICHIGAN: Isle Royale, 1849, *Whitney;* Keweenaw Co., 1863, *Robbins;* Marquette Island, 1913, *W. H. Manning*. MINNESOTA: border of Lake of the Woods, south of 49°, *Richardson*. MANITOBA: Churchill, *J. M. Macoun*, no. 79,398; Lake Manitoba, 1881, *Macoun*. SASKATCHEWAN. 1857–8, *Bourgeau*. ALBERTA: Rocky Mts., *Drummond;* Banff, *Canby et al.* BRITISH COLUMBIA: Macleod's Lake, lat. 55°, *Macoun*, no. 1559; Revelstoke, *Shaw*, no. 31. YUKON: Dawson, *Eastwood*, nos. 117, 491. ALASKA: Lake Iliamna Region, *Gorman*, no. 174.

Geocaulon lividum was beautifully illustrated, as *Comandra livida*, in Hooker, Flora Boreali-Americana, t. clxxix B. Although the accompanying description indicates no difference between the central and lateral flowers, the artist noted the difference and showed the central perfect flower much larger than the others.

II. THE AMERICAN AND EASTERN ASIATIC BECKMANNIA

IT has often been pointed out that the plant of northwestern North America and northeastern Asia which has passed as *Beckmannia erucaeformis* (L.) Host is not identical with the true *B. erucaeformis* (*Phalaris erucaeformis* L.) of southeastern Europe and southwestern Asia; but not until Hultén's recent scholarly publication upon the

flora of Kamtchatka[1] have the two plants been adequately contrasted. Hultén shows that there are two quite distinct species of *Beckmannia*.[2] True *B. erucaeformis* of Italy, Greece, Hungary, southern Russia and Asia Minor is a perennial with bulbous or "incrassated" bases, simple or but slightly compound and very short panicle-branches closely appressed to the rachis: spikelets mostly 2-flowered and strongly rounded; the glumes nearly semicircular, coriaceous and with a rounded keel and very narrow membranaceous border; the thick lemma short-mucronate or very short-pointed, scabrous and beset with long hairs along the median nerve. The plant of northeastern Asia and northwestern America, on the other hand, has the culms with soft bases, usually described as annual, commonly coarser and taller; the leaves broader; the panicle much more branched, with the principal branches longer and somewhat spreading; spikelets larger, mostly with 1 perfect and 1 aborted floret, pyriform; glumes rounded-triangular, broadest toward the apex, thin, strongly carinate, with a whitish scarious border; lemma thin, long-mucronate, glabrous or only slightly short-pilose on the dorsal nerve. For this plant of eastern Asia Hultén proposes the name *Beckmannia baicalensis* (W. Kuznetzow) Hultén,[3] based upon *B. erucaeformis*, var. *baicalensis* W. Kuznetzow (1913).

Hultén gives a careful discussion of the two plants and makes a good case for the specific segregation of *B. baicalensis;* but, unfortunately, he overlooked at least two available names which were published earlier than Kuznetzow's in 1913. In order clearly to understand these names it is well to start with the original *Phalaris erucaeformis* L.[4] Linnaeus did not differentiate the two and certainly included them both under *P. erucaeformis* which had its "*Habitat in* Sibiria, Russia, Europa *australi.*" After a brief original diagnosis, "PHALARIS panicula lineari secunda, calycibus bifloris," which certainly applies to the plant from "Russia, Europa *australi,*" he gave three citations: "Dactylis spicis numerosis alternis culmo adpressis longitudine internodiorum, calycibus bifloris. *Roy. lugdb.*

[1] Eric Hultén, *Flora of Kamtchatka and the Adjacent Islands*, i,—Kungl. Svenska Vetenskapsakad. Handl. Ser. 3, v. no. 1 (1927).

[2] In some of our American manuals we are told that the genus was named "In honor of Johann Beckmann, . . . teacher of Natural History at St. Petersburg." The original statement of Host, however, was: "Hoc proprii generis gramen in honorem Cl. viri Joannis Beckmanni, in Universitate Goettingensi Oeconomiae ruralis Professoris, nominavi"—Host, Ic. Gram. Austr. iii. 6 (1805).

[3] Hultén, l. c. 119 (1927).

[4] L. Sp. Pl. i. 55 (1753).

57. Gmel. sibir. I. p. 130. t. 29" and "Gramen palustre, locustis erucaeformibus. *Barr. rar. 1158. t. 2.*" Royen's description and his citation of the description and plate of Barreliero show that he had the Italian plant and although Barreliero said of the plant "Annum est," [1] he certainly had the plant of Italy, and the Linnean specific name was obviously derived from his *Gramen palustre, locustis Erucaeformibus*, a name given from the resemblance of the green spikes to caterpillars on the branches of a tree. Linnaeus's reference to Gmelin's Siberian plant alone belongs to *Beckmannia baicalensis*. Gmelin's plate is thoroughly typical for the latter species. With Linnaeus's own diagnosis and the plants of Royen and of Barreliero coinciding, and with the specific name clearly derived from Barreliero's account of the Italian plant, there can be no doubt that the name *B. erucaeformis* should be restricted to the plant of southeastern Europe and Asia Minor. The species is well illustrated in Host, Ic. Gram. Austr. iii. t. 206 (1805); Nees, Gen. i.t. 40 (1843) and Reichenbach, Ic. Fl. Germ. i. t. clxxi (1850).

That the wide-ranging northern plant is not identical with the Mediterranean species seems to have been first recognized by Steudel in 1846. Receiving the plant from Japan, Steudel, on account of the single perfect flower, the disarticulation of the spikelets below the glumes and the superficial resemblance of the plant to *Panicum brizoides* Jacq. and others with the inflorescence of *Echinochloa*, described it as *Panicum Syzigachne*.[2] Later, however, recognizing that his Japanese species belonged to *Beckmannia*, he reduced it to a variety of *B. erucaeformis*, "Variat: statura et omnibus partibus majoribus. Panicum Syzigachne. *Steud.* Flora 1846. p. 19. Japon." [3] In 1880 Dr. George Thurber, treating the grasses of California and retaining our plant as *B. erucaeformis*, made the note: "In all American specimens we have thus far examined the upper floret is wanting." [4] Thurber's observation was soon again emphasized by Vasey, who, in diagnosing *Beckmannia*, described the spikelets as "consisting of two perfect flowers, the terminal one only fertile, (or in American specimens the lower flower is suppressed);" and at the same time Vasey called the American plant *B. erucaeformis*, var. *uniflorus* Scribn.,[5] but without diagnosis further than by implication from the

[1] Barr. Plantae per Galliam, Hispaniam et Italiam Observatae, 105 (1714).
[2] Steud. Flora, xxix. 19 (1846).
[3] Steud. Syn. Pl. Gram. 15 (1854).
[4] Thurb. in Wats. Bot. Cal. ii. 264 (1880).
[5] Scribn. in Vasey, Descr. Cat. Grasses U. S. 8 (1885).

preceding note. In 1896 *B. erucaeformis uniflorus* Scribn. was used by Beal[1] for the American plant which was well described and illustrated by drawings of the spikelet supplied by Scribner; and in the 6th edition of Gray's *Manual*, Watson & Coulter took up *B. erucaeformis*, var. *uniflora*, a name dropped by Hitchcock from the 7th edition, where the plant is treated unequivocally as *B. erucaeformis*, although the genus, based upon a 2-flowered species, was by Hitchcock now defined as having "Spikelets 1-flowered in our species." In his later work the American and Asiatic plant is still maintained by Hitchcock as *B. erucaeformis* (without var. *uniflora* cited as a synonym); but the facts of the case are covered by the statement under the generic description: "Spikelets 1-flowered, rarely 2-flowered";[2] and under the specific description: "The European form has 2-flowered spikelets."[2] In 1913, W. Kuznetzow again named the Asiatic and American plant, his material coming from Transbaikalia, whence his new name *B. erucaeformis*, var. *baicalensis*,[3] upon which Hultén based the specific combination *B. baicalensis*. In taking up Kuznetzow's varietal name as the specific name for a plant which extends half way around the northern hemisphere Hultén was apologetic: "Although his variety name is not very suitable for the species, I have thought it most correct to retain it" (p. 121). Unfortunately, however, *correct* following of nomenclatorial rules forces us to use for the species a name in some ways less desirable than *B. baicalensis*. The correct name of the plant seems to be

BECKMANNIA **Syzigachne** (Steud.), n. comb. *Panicum Syzigachne* Steud. Flora, xxix. 19 (1846). *B. erucaeformis*, var. Steud. Syn. Pl. Gram. 15 (1854). *B. erucaeformis*, var. *uniflorus* Scribn. in Vasey, Descr. Cat. Grasses U. S. 8 (1885), name only; in Beal, Grasses N. A. ii. 428, fig. 77 (1896). *B. erucaeformis*, var. *baicalensis* W. Kuznetzow, Bull. Angev. Bot. vi. No. 9: 584 (1913). *B. baicalensis* (W. Kuznetzow) Hultén, Kungl. Svenska Vetenskapsakad. Handl. Ser. 3, v. no. 1: 119 (1927).

Beckmannia Syzigachne, as previously stated, was well illustrated by Gmelin. Scribner's figures of the spikelet of his *B. erucaeformis*, var. *uniflorus* are excellent, and Mrs. Chase's illustration (as *B. erucaeformis*) in Hitchcock, Gen. Grasses U. S. fig. 108 is very characteristic.

[1] Beal, Grasses, N. A. ii. 428, fig. 77 (1896).
[2] Hitchc. Gen. Grasses U. S. 180, 182 (1920).
[3] W. Kuznetzow, Bull. Angev. Bot. vi. No. 9: 584 (1913).

III. THE EASTERN AMERICAN VARIETY OF POLYSTICHUM BRAUNII

(Plate 159)

THE plant which has been passing in eastern America as *Polystichum Braunii* (Spenner) Fée abounds in rich woodlands and glades or on shaded talus and rock-slides of northern and western Newfoundland, Anticosti Island and the Gaspé Peninsula of Quebec. Westward and southward it becomes more local, extending west to Algoma District, Ontario and south (at low altitudes) to Cape Breton Island and Colchester and Kings Counties, Nova Scotia and Charlotte County, New Brunswick, and (chiefly in the mountains) to Aroostook, northern Penobscot, northern Piscataquis, northern Somerset and Franklin Counties, Maine, Carroll and Grafton Counties, New Hampshire, Berkshire County, Massachusetts, Ulster and Delaware Counties, New York, Sullivan County, Pennsylvania and Keweenaw County, Michigan. It is thus completely isolated from *P. Braunii* of Europe, which is there a plant of decidedly southern range: localized in upland woods of the Caucasus and southern Russia, and from the Transylvanian and Croatian Alps to the Maritime Alps and the Pyrenees, extending northward in the mountains to southern Germany, where (according to Milde) it is abundant in some regions of Silesia. North of southern Germany it is found at two stations in southernmost Sweden and at scattered stations in southern Norway, thence extending to a point (Brönnö) about midway along the western coast of Norway. It is not in arctic Europe, nor does it reach the British Isles, Iceland and Greenland; and the plant of eastern America does not extend north of the St. Lawrence basin, being decidedly a Canadian type. Outside Europe, *P. Braunii* is known in Eurasia only in northeastern Asia, whence it apparently extends across into southern Alaska. The Japanese plant is at least varietally distinct, var. *japonicum* Christ; and in Alaska there is a related plant, *P. alaskense* Maxon, which in its more attenuate pinnae and more tapering bases of the pinnules closely simulates the Kamtchatkan *P. Braunii*, var. *kamtschaticum* C. Chr. & Hultén, Kungl. Vet. Akad. Handl. v. no. 1: 38, t. 2 (1927), but its fronds are simply bipinnate, those of var. *kamtschaticum* tripinnatifid. European authors are in the habit of citing the Hawaiian Islands as also having *P. Braunii*, but the Hawaiian plants, *P. haleakalense* Brack. and *P. Hillebrandii* Carruth., are thoroughly distinct in many obvious characters. The Alaskan

material which may belong to *P. Braunii* is fragmentary and its identity, therefore, not readily settled, and at least some of the plants of eastern Asia are more like the eastern American than the European plant.

The plant of the Canadian forest of southeastern Canada and the northeastern states, unknown on the Labrador Peninsula or in Greenland, has obviously been long isolated from the European plant, unknown in arctic Europe, the British Isles and Iceland. As a general rule, flowering plants with such ranges would be found to have quite definite characters of flower and fruit and would stand as good species: such pairs as *Carex loliacea* L. (Eu., e. Asia and n.w. Am.) and *C. trisperma* Dew. (Atl. N.A.), *C. alba* Scop. (Eu., e. Asia) and *C. eburnea* Boott (Atl. N. A.), *Luzula pilosa* (L.) Willd. (Eu. and w. Asia) and *L. saltuensis* Fern. (Atl. N.A.), *Hepatica nobilis* Schreb. (Eu.) and *H. americana* (DC.) Ker. (Atl. N.A.), etc., etc.; but, although showing recognizable, though slight, differences in the scales of the stipe and rachis, in the texture of the frond and the toothing of the pinnules, the American and European plants have essentially identical spores.

P. Braunii of Europe is generally described as having herbaceous fronds: "Blätter . . . weich . . . nicht überwinternd"—Luerssen; "Textur krautig"—Christ; "*Frondes* . . seulement *membraneuses*" —Rouy; but in the plant of eastern America they are subcoriaceous. Consequently, in the European plant the venation of the pinnules is distinctly seen under low magnification; in the American ordinarily it is rather obscure. The largest scales of the stipe-bases in the European plant are rather firm and are prolonged into bristle-tips 5–8 mm. long; in the eastern American they are much thinner and shorter-pointed (the bristle-tip 1–4 mm. long). Under considerable magnification the median cells of the large scales of the European plant appear elongate-linear, with heavy cell-walls and extremely narrow lumina; while in the eastern American plant the thinner scales show shorter-linear to oblong cells (mostly 100–300 μ long) with very thin walls and broad lumina, a difference similar to that separating the European *Thelypteris spinulosa*, var. *dilatata* (Hoffm.) St. John and the American var. *americana* (Fischer) Weatherby. In the European plant the back of the rachis (especially the lower half) bears innumerable retrorse soft acicular scales which are far more numerous than the lanceolate scales; in the eastern American plant the relation is

reversed, the lanceolate scales being more abundant than in the European, the acicular scales fewer and shorter. In the European plant the terminal (and often the marginal) bristles of the pinnules are 1–2 mm. long; in the plant of eastern America 0.5–1.3 mm. long. Only a few good indusia of the European plant have been available for study, consequently it has not been possible to make a satisfactory comparison of this organ in the two plants; but, as stated, the spores present no appreciable difference unless it is that the American are minutely larger.

With essentially identical spores and outline of frond, pinnae and pinnules, the two plants illustrate the conservatism of the ferns. They have obviously been long isolated but their segregation has proceeded only far enough to affect the superficial vegetative characters. These, however, are sufficient to make it clarifying to distinguish the eastern American (and northern Chinese) plant as a geographic variety; and since the first American record of the plant was based upon its discovery by Frederick Pursh in the Green Mountains of Vermont in 1807 it is appropriate that it be called

Polystichum Braunii (Spenner) Fée, var. **Purshii**, n. var., forma typica recedit frondibus subcoriaceis; stipitis squamis scariosis latissimis acutis vel breviter aristatis, arista 1–4 mm. longa, cellulis mediis oblongis vel linearibus 100–300 μ longis lumine lato parietibus tenuibus pallidis; rhacheos squamis lanceolatis fibrillosisque illis pluribus; pinnularum aristis terminalibus 0.5–1.3 mm. longis.—Cool woods, glades and shaded talus, northern and western Newfoundland, Anticosti Island and Gaspé Peninsula, Quebec to Algoma District, Ontario, south to Cape Breton and Colchester and Kings Counties, Nova Scotia, York and Charlotte Counties, New Brunswick, Aroostook, northern Penobscot, northern Piscataquis, northern Somerset and Franklin Counties, Maine, Carroll and Grafton Counties, New Hampshire, Berkshire County, Massachusetts, Ulster and Delaware Counties, New York, Sullivan County, Pennsylvania and Keweenaw County, Michigan; southward chiefly at altitudes from 300–1525 m. (1000–5000 feet); also northern China and Sachalin Island. Type: Smuggler's Notch, Vermont, August 9, 1877, *C. E. Faxon* (in Gray Herb.), distributed as *Aspidium aculeatum*, var. *Braunii*.

This is the plant which has regularly passed in eastern America as *Aspidium aculeatum*, *A. aculeatum*, var. *Braunii*, *Polystichum aculeatum*, var. *Braunii* and *Polystichum Braunii*.

Explanation of Plate 159

Polystichum Braunii, var. Purshii. A small plant, × ⅓, from Colebrook, New Hampshire, *Pease*, no. 10,387. Photograph by *Professor J. F. Collins*.

(*To be continued*)

POLYSTICHUM BRAUNII, VAR. PURSPII. × 1/3.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXIX.

(*Continued from page 30.*)

IV. THE AMERICAN REPRESENTATIVES OF ASPLENIUM RUTA-MURARIA

It has been repeatedly remarked by American students of ferns that, whereas *Asplenium Ruta-muraria* L. of Europe acquired its name from its common habitat, the plant of North America is rarely, if ever, found on brick- or stone-walls. European botanists are essentially unanimous as to the habitat of their plant. Thus, more than a century ago, the great student of the ferns, Schkuhr, stated it: "Hab. ad muros et in fissuris rupium";[1] and later authors give the following statements. Moore: "on rocks and on ruins, and in abundance on old walls";[2] Hooker: "Common on rocks and old walls and buildings";[3] Lowe: "Delighting to grow on old walls, both brick and stone, and more especially on the northern side, and preferring to mount up the walls as high as possible";[4] Britten: "The name is an apt one, . . . although not confined to walls, it is essentially a wall plant";[5] Christ: "In bewohnten Europa ist die Art von dem anstehenden Fels und den grössern Blöcken auf die Mauern, sowohl die rohen Trockenmauern der Strassenborde und Kulturterrassen, als auf die ältern, mit Mörtel verbundenen Mauern gewandert, sodass wohl im ganzen solche künstliche Standorte vorwiegen; daher

[1] Schkuhr, Krypt. Gewächse, 75 (1809); rupium *misprinted* "pupium."
[2] Moore, Nat. Printed Brit. Fern. oct. ed ii. 121 (1860).
[3] Hooker, Brit. Ferns, t. 28 (1861).
[4] Lowe, Our Native Ferns, ii. 222 (1867).
[5] Britten, Eur. Ferns, 111 (1881).

der Name";[1] Druery: "common on old walls, bridges, etc. . . . . almost invariably rooted in old mortar."[2] Contrasted with these typical statements of the European habitat we have in America, such statements as the following. Torrey: "Limestone rocks, usually in shady situations: rare";[3] D. C. Eaton: "clefts of calcareous rocks . . . but not seen on walls in America";[4] Clute: "It loves the sheltered nooks on dry cliffs";[5] Waters: "It grows on sunny, exposed cliffs, or boulders";[6] Slosson: "Seams, pockets, and ledges of calcareous rock: usually exposed to sun or in partial shade."[7] From these characteristic statements it would appear that the plant of eastern America is a conservative and comparatively rare fern, that of Europe an aggressive and common type.

The ranges of the Eurasian and the American plants are also strikingly contrasted. *Asplenium Ruta-muraria*, according to the late James Britten, is "found in most parts of the United Kingdom [Great Britain and Ireland]"; thence "It extends throughout Europe, from Norway to Spain and Portugal, Italy, the Mediterranean Islands, Greece, and Turkey. It is found both in North and South Africa, and in many parts of Asia, from the Ural Mountains to Thibet and Kashmir,"[8] etc. Christensen, however, cuts out the South African occurrence and says merely: "Europa. Asia septentr.—Himalaya. U. S. A. orient.";[9] but he has subsequently cited it from southwestern China near the Thibetan border.[10] Ledebour[11] does not cite it from east of Lake Baikal and it is apparently not found in extreme eastern Asia.[12] The American plant occurs from Vermont to southern Ontario, south to Alabama and Arkansas; *i. e.* it has an Alleghenian range.

Long experience has shown that the Alleghenian flora is to a great extent made up of ancient species, with their nearest affinities in Japan or adjacent continental eastern Asia, rather than in western

[1] Christ, *Die Varietäten und Verwandten des Asplenium Ruta muraria L.*, Hedwigia, xlii. 155 (1903).

[2] Druery, Brit. Ferns, 76 (1910).

[3] Torr. Fl. N. Y. ii. 492 (1843).

[4] D. C. Eaton, Ferns N. A. i. 108 (1879).

[5] Clute, Our Ferns in their Haunts, 162 (1901).

[6] Waters, Ferns, 157 (1903).

[7] Slosson, How Ferns Grow, 28 (1906).

[8] Britten, l. c. 112 (1881).

[9] C. Christens. Ind. Fil. fasc. iii. 130 (1905).

[10] C. Christens. Acta Hort. Gothob. i. 80 (1924).

[11] Ledebour, Fl. Ross. iv. 520 (1852–3).

[12] It has been recorded as very rare in Japan, but neither Christ nor Christensen admit it from there.

Eurasia. Consequently, it would be most unusual for a rare or conservative plant, which in America is unknown north of Vermont and southern Ontario, to be common in Europe but rare or quite unknown in eastern Asia. Furthermore, it is quite contrary to our ordinary experience, that a local and non-aggressive Alleghenian species should in Europe be a common plant, there taking possession of the artificial walls built by man: roadside- and garden-walls, the mortar of brick or stone buildings, bridges, and even church-steeples. There are plenty (more than a thousand) of cases of youthful and aggressive European plants introduced into temperate eastern America and quickly overrunning the region; but, with the exception of the calcicolous aquatic, *Elodea canadensis*, conservative plants of temperate eastern America have rarely, if ever, shown pioneering tendencies in Europe.

From these considerations it would be surprising if the common European *Asplenium Ruta-muraria* and the rare fern of Alleghenian America are really identical. Nevertheless, I can find little indication in literature that they have even been suspected of being different. Most students of the ferns, Hooker, Moore, Mettenius, Luerssen, Milde, D. C. Eaton, Underwood, Slosson, Christensen and many others, seem to have regarded them as strictly identical; and some have even made positive assertions of the identity. Thus, Torrey, in 1843, said of the American fern: "In all respects similar to the European plant, except that it is usually smaller";[1] and Christ,[2] making a detailed study of the variations of the species, recognized no less than 17 varieties and subvarieties in Europe and identified with 4 of these European varieties the plants of eastern America. Very rarely a mild suggestion of a difference has been voiced. Thus, Michaux made the "*Obs.* Europaeo multo minus";[3] Pursh, similarly said: "The American plant is very small, scarcely ever exceeding an inch or two in height";[4] and Torrey's comment to the same effect has just been quoted. But since Torrey, apparently no one has commented even on the difference of size.

When the two series are carefully measured, however, the accuracy of the observations of Michaux, Pursh and Torrey becomes quite evident. I have studied 154 plants of the European series, with an

[1] Torr. l. c. 492 (1843).
[2] Christ, l. c. (1903).
[3] Michx. Fl. Bor.-Am. ii. 266 (1803).
[4] Pursh, Fl. Am. Sept. ii, 667 (1814).

average of 10 or 12 fronds each, and 290 plants of the American series, with an average of 6 or 8 fronds each. Measurements of stipe and frond and count of segments give the following results: the stipes of the European plant range from 1.8–15 cm. long, with an average length of 7 cm., of the American series 1–7.5 cm. with an average length of 4.5 cm.; the fronds of the European plant range from 1.5–7.5 cm. in length, with an average of 4 cm., those of the American plant from 1–6.5, with an average of 3.3. cm.; the largest fronds of each collection show in the European 7–60 segments (average 33) in the American 3–42 (av. 15). The difference of size noted by Michaux, Pursh and Torrey is, thus, very real.

But the differences are not limited to size. In European *Asplenium Ruta-muraria* the teeth of the segments are commonly bordered by a whitish cartilaginous rim which is frequently prolonged into a minute tip, and the mature sori become so confluent that their boundaries are quite obscured. In the American plant the teeth of the segments are coarser than is usual in the European and the cartilaginous border is only slightly, if at all, developed; and the mature sori are rarely completely confluent.

In the European plant the chaffy tips of the rhizomes and the chaffy bases of the stipes project above the root-bearing region of the short and thick rhizome and are easily seen under a low-power lens; in the American the tips of the rhizome and the chaffy stipe-bases are hidden among the rootlets of the elongate rhizome and can be seen only by dissecting away rootlets and marcescent old stipe-bases. This really important difference of the rhizomes has been beautifully shown, but apparently quite unappreciated, in some of the best illustrations. It is well displayed in such European illustrations as those of Schkuhr,[1] Lowe,[2] Britten[3] and Druery[4] and in the American plates of John Robinson,[5] Williamson,[6] D. C. Eaton[7] and Tilton.[8]

When the basal chaff is examined it will be found that the scales of the European *Asplenium Ruta-muraria* are 3–6 mm. long, made up of a lattice-like frame with whitish lumina, the broadest part of the scale with usually 6–9 rows of cells, the cell-walls much thinner than

[1] Schkuhr, l. c. t. 80b (1809).
[2] Lowe, Our Native Ferns, ii. t. xlviii. (1869).
[3] Britten, l. c. figs. on pp. 111 (copied from Gerarde's Herbal) and 112 (1881).
[4] Druery, Brit. Ferns and Vars. t. v. (1910).
[5] J. Robinson, Ferns in their Homes and Ours, t. xvi. (1878).
[6] Williamson, Ferns of Ky. t. xix. (1878); Fern Etchings, t. xxiv. (1879).
[7] D. C. Eaton, l. c. t. xv. fig. 1 (1879).
[8] Tilton, Fern Lover's Comp. 89 (1922).

the broad lumina; while the basal scales of the American plants are shorter and firmer, 1.5–4 mm. long, with fewer rows of cells, the cell-walls as thick as the lumina. In the European plant the stipe usually bears slender curving trichomes or linear-filiform scales 1–3 mm. long; in the American series the stipe is quite naked or only rarely with a few short trichomes.

The indusia of the two plants are so similar as to present no quickly recognized differences, but, as already noted, the sori of the American are rarely as confluent as in the European. The spores are of practically the same size; but, whereas those of the European plant are marked with coarse irregular ridges, the spores of the American have a much finer sculpturing.

From this analysis it is apparent that Eurasian *Asplenium Ruta-muraria* is in its behavior and its technical details quite different from the Alleghenian plant which for a century and a quarter has been confused with it. It is, therefore, proper to separate the Alleghenian species as

Asplenium **cryptolepis,** n. sp., ab *A. Ruta-muraria* recedit rhizomate elongato apicibus radiculis basibusque stipitium marcescentibus vestito; stipitibus 1–6.5 (medio 4.5) cm. longis ad basin squamis setiformibus paucis instructis supra plerumque esquamosis; squamis basilaribus firmis lanceolatis 1.5–4 mm. longis loco latissimo cellulis 3–6-seriatis, parietibus cellularum crassis diametro luminum subaequantibus; lamina deltoidea vel deltoideo-ovata 1–6.5 (medio 3.3) cm. longa subcoriacea; segmentis 3–42 (medio 15) cuneato-rhombeis grosse dentatis, dentibus deltoideis vel oblongis obtusis vel subacutis margine plerumque vix hyalino; soris distinctis vel subconfluentibus; sporis minute rugulosis.—*A. Ruta-muraria* of Am. authors, not L.—Calcareous cliffs and ledges, rare and local, Vermont to southern Ontario, south to Alabama and Arkansas. The following, selected from many specimens, are typical. Vermont: North Willoughby Cliff, July 14, 1887, *Faxon;* dry limestone ledge, Milton, August 6, 1924, *C. H. Knowlton;* Winooski Gorge, Colchester, *Blake,* no. 2153; Sharpshin Point, Burlington, October 3, 1857, *Wm. Boott;* Burlington Bay, July 7, 1909, *Kirk;* High Bridge, Winooski, August 7, 1877 and June 14, 1881, *Faxon;* Shelburne Bay, September 29, 1855, *Wm. Boott;* Mt. Philo, Charlotte, September 9, 1881, *Faxon;* Snake Mt., Addison, June 31, 1896, *Eggleston;* Pittsford, *Slosson;* Clarendon Gorge, August 27, 1897, *G. H. Ross;* rocks, Dorset, 1915, *E. H. Terry;* Mt. Aeolus, East Dorset, August 29, 1897, *Eggleston;* limestone ledges in hillside pasture, East Dorset, July 24, 1907, *G. G. Kennedy;* Manchester, *M. A. Day,* no. 253; cliffs, North Pownal, July 25, 1898, *Eggleston;* August 1, 1898, *Churchill;* crevices of ledges, usually in half-shade, The Cliff, North Pownal, June 22, 1901, *F. G.*

Floyd; with *Camptosorus*, Gregor Rocks, North Pownal, August 12, 1902, *Blanchard.* Massachusetts: Mt. Toby, Sunderland, August 10, 1871, *L. B. Tuckerman*, and later collections by *Bishop, Jesup et al;* rocky hill, Stockbridge, June 27, 1900, *Ralph Hoffmann;* shaded limestone ledges, Sheffield, July 6, 1906, *Bissell* (type in Gray Herb.); lime ledge, Sheffield, June 1, and September 30, 1919, *Churchill.* Connecticut: lime ledges, Canaan, August 14, 1912 and October 28, 1916, *F. G. Floyd;* shaded limestone ledges, Salisbury, September 22, 1903, *Bissell;* ledges, Miles Mt., Salisbury, October 19, 1916, *F. G. Floyd;* calcareous rocks by Housatonic River, Kent, *Austin & Eames*, no. 4059; Bull's Falls, above Gaylordsville, July 28, 1889, *I. Holden;* dry calcareous rocks, Gaylordsville, *Austin & Eames*, no. 8308; moist shaded limestone ledge by Housatonic River, New Milford, *A. E. Blewitt*, no. 1205; dry limestone on shaded bank of Housatonic, New Milford, *Austin & Eames*, no. 8308. New York: Poughkeepsie, *Van Gieson;* Little Falls, *Vasey;* Jamesville, July, 1885, *Hulst.* New Jersey: vicinity of Newton, *Dowell*, no. 4816; limestone rocks, Sussex Co., 1867, *Austin.* Pennsylvania: Wilkesbarre, 1867, *H. Coultas;* Easton, *Traill Green;* Bushkill Creek, Northampton Co., *L. M. Stevens;* along Mill Creek, near Lancaster, July 15, 1890, *Small;* limestone cliffs, Centre Co., *Tuttle & Rothrock.* Virginia: at 365–460 m. (1200–1500 ft.), Mt. Crawford, Rockingham Co., *Heller*, no. 785; Natural Bridge, May 30, 1891, *Churchill*, and at later dates by *Kennedy, T. O. Fuller et al;* Wythe Co., June 7, 1872, *A. H. Curtiss.* West Virginia: Harper's Ferry, *B. D. Greene;* shaded limestone bluff by Shenandoah R., Jefferson Co., September 9, 1899, *Wm. Palmer.* North Carolina: on ledges at 1220 m. (4000 ft.), Pilot Mt., July 4, 1915, *P. O. Schallert.* Ontario: north end of Manitoulin Island, Georgian Bay, *Scott* in herb. Geol. Surv. Can. no. 66,415. Michigan: without locality, *State Collection.* Indiana: limestone, Jefferson Co., 1872, *J. Hussey.* Tennessee: on rocks along Tennessee R., Knoxville, *Ruth*, no. 556; Holston River, below Concord, July, 1872, *W. Faxon;* Post Oak Springs, Roane Co., *Pollard & Maxon*, no. 412. Missouri: calcareous rocks, near Lott's Mills, Perry Co., November 15, 1886, *C. H. Demetrio;* wet mossy rocks, Shannon Co., *Bush*, no. 436; on boulders in woods, Montier, *Bush*, no. 2795; shaded limestone rocks, near Montier, *E. J. Palmer*, no. 19,343.

Illustrations (as *A. Ruta-muraria*): J. Robinson, Ferns in their Homes and Ours, t. xvi. (1878); Williamson, Ferns of Ky. t. xix. (1878) and Fern Etchings, t. xxiv. (1879); D. C. Eaton, Ferns N. A. i. t. xv. fig. 1 (1879); Tilton, Fern Lover's Comp. 89 (1922).

European *Asplenium Ruta-muraria* is so variable that many varieties have been proposed, Milde recognizing 10, Christ 17. *A. cryptolepis*, on the other hand, is a tolerably constant plant. The fronds of young or small individuals have fewer and more dilated segments than in the older or larger plants but such variation is found in the

individual colonies and is of no taxonomic importance. In one area, however, the limestone cliffs of Clifton Gorge, of the Little Miami River in Greene County, Ohio, the plant has so far departed from typical *A. cryptolepis* that it may well be designated as a geographic variety. The six different collections before me are constant in having lanceolate segments with long-attenuate tips and incised margins. This extreme may be called

A. CRYPTOLEPIS, var. **ohionis**, n. var., segmentis lanceolatis incisis apice longe attenuatis.—OHIO: Springfield, *T. G. Lea;* Clifton, Greene County, 1873, *J. Y. Bergen, Jr.;* limestone rocks, Yellow Springs, Greene Co., August 3, 1902, June 15, 1905, *L. S. Hopkins* (TYPE in Gray Herb.); on Niagara limestone, Clifton Gorge, Little Miami River, August 22, 1920, *Clara G. Mark.*

Of this Ohio variety, Mr. L. S. Hopkins wrote, in 1907:

"The single station known for it is in Greene County, and at the present time numbers approximately one hundred plants whose short stiff rootstocks find solid footing in the cracks and crevices of a western exposure of Niagara Limestone. No other fern with which I am acquainted is so exacting in its choice of a home. This station has been under my observation for several years, and quite a number of plants have been collected from it. Just around a corner and not over five feet from the place where strong, vigorous plants grow, not a single plant has been found on a southern exposure of the same material and ecological conditions."—L. S. Hopkins, Fern. Bull. xv. 6 (1907).

That the plants of var. *ohionis* have been more numerous is indicated by the collections of Lea and of Bergen (two different collections) and by the fact that material of it has been widely distributed to different herbaria. Such a specimen, collected at Clifton in 1877 by G. E. J. Spencer, was the basis of the erroneous identification by Christ[1] of the Ohio plant with the European *A. Ruta-muraria*, var. *lanceolum* Christ—the European plant, as shown in Christ's plate, having the numerous (42–54) segments of *A. Ruta-muraria*, with their teeth few and small or obsolete, *A. cryptolepis*, var. *ohionis* having the few (5–28) segments and other characters of *A. cryptolepis*, but with elongate tips and incised margins.

[1] Christ, Hedwigia, xlii. 171 (1903)

V. THE EASTERN AMERICAN OCCURRENCE OF ATHYRIUM ALPESTRE

(Plates 161–168)

In 1917 Dr. F. K. Butters pointed out[1] that the plants which had long passed in America as *Athyrium alpestre* (Hoppe) Rylands or as *Phegopteris alpestris* (Hoppe) Mett. differ from the Eurasian type and he called our plant *A. alpestre*, var. *americanum;* and a year later Maxon, emphasizing, besides the characters noted by Butters, some habital points of the plant of western North America, elevated it to specific rank as *A. americanum* (Butters) Maxon[2] and designated as the type (which Butters had neglected to do) a plant from the Selkirk Mountains. Still later, Christensen, who certainly knows the Eurasian plant, after discussing the Eurasian range of *A. alpestre* said: "In America the closely allied form *A. alpestre americanum* Butters."[3] The treatments recently published give us, then, the choice of calling the American plant either *A. alpestre*, an endemic American variety, an endemic American species or a "closely allied form," and it is with the hope of throwing some clearing light upon the dilemma that the present notes and the accompanying photographs are presented.

In eastern America *Athyrium alpestre* or its representatives are as yet known from only two regions: the gulches of Bard Harbor Hill, one of the Highlands of St. John, in northwestern Newfoundland, and the northern and northeastern slopes of the Table-top Range in Gaspé County, Quebec. On my four different visits to these areas I have during the first days studied the plants with enthusiasm and have put up, altogether, hundreds of sheets of specimens; but in each case, the plants soon proving to be abundant, my enthusiasm for them has gradually waned. The plant of Gaspé had been included by Butters and by Maxon with the cordilleran var. *americanum* or *A. americanum;* consequently, when the Newfoundland material was labeled it was assumed to be the same and it was later recorded[4] without question as var. *americanum*. Comparison now shows, however, that the Newfoundland and Gaspé plants are not quite identical, nor are either of them satisfactorily placed with the cordilleran plant. The plant of Eurasia has decidedly "leafy" fronds,

[1] Butters, Rhodora, xix. 204 (1917).
[2] Maxon, Am. Fern. Journ. viii. 120 (1918).
[3] C. Christens. in Hultén, Fl. Kamtch. and Adj. Isl. i. 40 (1927).
[4] Fernald, Rhodora, xxviii. 117, 148 (1926).

ordinarily elliptic-lanceolate to ovate-lanceolate (pl. 161), one-fourth to one-half as broad as long, but in extreme specimens from open habitats (pl. 162) they are narrowly elliptic-oblong. Their larger pinnae are spreading or obliquely ascending, from oblong-lanceolate to narrowly deltoid and pinnatifid into broad-based oblong ultimate lobes; the sori are median and when well developed 0.75–1.4 mm. across and seemingly without any indusium. According to Butters, "Careful dissection shows, however, that the receptacle of the sorus is slightly elongated along the vein, and under a compound microscope it is almost always possible to find a vestigial indusium in the same position that the indusium holds in forms of *A. Filix-femina* with round sori. This indusium . . . often consists merely of two or three hairs joined together side by side at the base."

Athyrium alpestre, var. *americanum* Butters was described as having the segments of the fronds narrower and more distant than in the European plant, the ultimate ones linear; sori only 0.5–0.7 mm. across, submarginal and partly covered by the reflexed marginal teeth; vestigial indusium wanting. Butters added that, "As certain intermediate forms occur, it is the opinion of the author that this plant should be considered a distinct geographical variety rather than a species." Maxon, on the other hand, subsequently said "An examination of the very ample material in the National Herbarium, however, including some of the numbers cited by Butters as intermediate in leaf cutting, reveals no specimens which are truly intermediate in this or other respects . . . The American material is essentially uniform in all respects save size, and since it differs constantly from the European plant it should rank as a distinct species, **Athyrium americanum**. The invariable absence of reduced indusia, which might be regarded as an inconsequential point if the plants were otherwise like the European, is a substantiating character of some worth; but disregarding this feature, the plant is different enough in gross characters to warrant separation. The conspicuously narrow, oblique, widely separated segments give it a strict, singularly skeleton-like aspect widely different from that of the leafy European plant, which has the segments spreading and more broadly attached; and the oblique, elongate-deltoid pinnae (with the basal pinnules often greatly produced) are equally at variance from the spreading, oblong-acuminate pinnae of the European species." Another character of the plant of northwestern North America not emphasized by Butters

nor by Maxon is the almost consistently linear-oblong to lance-oblong outline of the frond which certainly averages much narrower in proportion to its length than does the European frond. Reduced specimens of the European plant (pl. 162) have fronds very similar in outline to some of var. *americanum* (pl. 163) but well-developed European plants (pl. 161), have an elliptic- to ovate-lanceolate outline.

If the extreme plant of western North America (pl. 164) were alone to be considered, *Athyrium americanum* would upon some characters stand well apart; but when we take into account the Gaspé material, which both Butters and Maxon identify with *A. americanum*, and the Newfoundland material, the specific separation of the American from the European plant becomes more difficult. Such typical Newfoundland specimens as shown in pl. 165 and 166 (a small plant and a large frond from the same station) have essentially the outline, pinnae and degree of dissection of the two extremes of the European plant shown (pl. 161 and 162) and they also have the sori large and submedian as in the European plant. It does not seem possible, then, to separate them specifically or even varietally from the European material. It should be noted, furthermore, that their pinnae and those of the two European specimens illustrated are a bit more oblique than and quite as "elongate-deltoid" as in the type of *A. americanum* (pl. 167) specially selected by Maxon. Incidentally, one of the stated characters of *A. americanum* was that each sorus is "protected by a reflexed tooth of the pinnule." This character (which seems to be more ecological than morphological) is obvious in most American specimens but in some extra-American material (for instance Davidsson's Iceland plant, pl. 162) the teeth are even more vigorously reflexed than in the type of *A. americanum;* and many continental European specimens show some reflexing of the teeth. As a differential character it has no value.

The Gaspé plant (pl. 168) differs at once from the European and Newfoundland material seen in its tripinnate or, in large plants, almost quadripinnate fronds, with the ultimate strongly toothed segments linear or linear-lanceolate and remote; and its submarginal sori are only 0.3–0.8 mm. across. Its fronds have the elliptic-lanceolate to ovate-lanceolate outline of the European and Newfoundland plant, rather than the linear-oblong to narrowly lance-oblong outline of *A. americanum.* The Gaspé plant is, therefore,

intermediate between that of Europe and Newfoundland and that of the cordilleran region; the European and Newfoundland plant at one extreme, the cordilleran at the other extreme of a series.[1]

Of the characters which have been ascribed to *Athyrium americanum* as distinctive the reputedly more oblique and elongate-deltoid pinnae are no more oblique nor deltoid in the type of *A. americanum* than in some characteristic specimens of the European plant, while the recurving of the marginal teeth is more conspicuous in some European specimens than in many of the American. The characteristically narrow outline of *A. americanum* appears in several sheets of European material, while the Gaspé plant, which both Butters and Maxon have considered identical with the cordilleran, has, when well developed, as broad an outline as the most extreme European plant. There remain to distinguish the continental American plants the narrower and more distant segments with smaller and mostly submarginal sori and the absence of the minute vestigial indusium which is often found, after sufficient search, in the European. But some specimens of the European plant before me have sori as small as in the American, the Gaspé plant has fronds as broad as in the broadest European, and at one of its stations (Southwest Gulch, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,245) the fronds of the Newfoundland plant are unusually divided and thus make a strong approach to those of the Gaspé plant. In view of these facts I am forced to the conclusion, originally reached by Butters and recently subscribed to by Christensen, that *A. alpestre*, var. *americanum* is a geographic variety rather than a species; but that the plant of Gaspé is not var. *americanum*, but is a second variety standing morphologically as well as geographically midway between typical *A. alpestre* and its var. *americanum*.

These conclusions may be summarized in the following brief synopsis.

[1] This geographic phenomenon, the Newfoundland variant of a circumpolar series being nearer to the European than to the plant of continental eastern America, is frequent and I have specially noted it in the case of *Cypripedium parviflorum*, var. *planipetalum* Fern. Rhodora, xxviii. 168 (1926) and *Habenaria viridis*, var. *interjecta* Fern. l. c. 173 (1926). The Cypripedium of northern and western Newfoundland is so similar to the Eurasian species that, at the time of describing the Newfoundland plant, I suggested that *C. Calceolus* of Eurasia and *C. parviflorum* of continental North America might be extremes of one circumpolar type, with the Newfoundland plant bridging the morphological gap which separates them. Similarly, the northern Newfoundland (and northwest American) variety of *Habenaria viridis* is exactly intermediate between typical *H. viridis* of Europe and its var. *bracteata* of eastern North America. It is interesting, therefore, to add *Athyrium alpestre* to the species showing this European and Newfoundland relationship.

Fronds bipinnate or somewhat tripinnatifid, elliptic-lanceolate to ovate-lanceolate (rarely lance-oblong), mostly one-fourth to one-half as broad as long; pinnules oblong-lanceolate, with the broad-based oblong ultimate lobes mostly approximate: sori median or submedian, the larger ones 0.75 to 1.4 mm. across.....*A. alpestre*, var. *typicum*.

Fronds tripinnatifid, tripinnate or nearly quadripinnate; ultimate segments of the pinnules linear or linear-lanceolate and distant: sori chiefly submarginal, mostly 0.3–0.8 mm. across.

Fronds elliptic-lanceolate to ovate-lanceolate, from three-tenths to nearly one-half as broad as long, tripinnate to nearly quadripinnate.....Var. *gaspensis*.

Fronds linear-oblong to narrowly lance-oblong, from one-tenth to one-fourth as broad as long, tripinnatifid to tripinnate.....Var. *americanum*.

Athyrium alpestre (Hoppe) Rylands, var. **typicum.** *Aspidium alpestre* Hoppe, Neue Taschenbuch, 216 (1805). *Pseudathyrium aspestre* (Hoppe) Newm. Phytologist, iv. 370 (1851). *Phegopteris alpestris* (Hoppe) Mett. Fil. Hort. Lips. 83 (1856). *Athyr. alpestre* (Hoppe) Rylands in Moore, Ferns Gr. Brit. and Irel. Nat. Print. fol. ed. t. 7 (1857).—Eurasia and northwestern Newfoundland. The following are from Newfoundland: wet quartzite rocks and seepy banks along upper Deer Pond Brook, Highlands of St. John, July 28, 1925, *Fernald & Long*, no. 27,242; quartzite escarpment one-half mile south of Deer Pond, August 20, 1925, *Wiegand, Gilbert & Hotchkiss*, nos. 27,212, 27,243—see pl. 165 and 166; turfy and mossy quartzite rocks along Man's Humbug Brook, Highlands of St. John, August 21, 1925, *Fernald & Long*, no. 27,244; wet quartzite rocks and gravel along brook, Southwest Gulch, northeast of summit of Bard Harbor Hill, August 22, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,245; these stations all at altitudes from 260–460 m. (850–1500 ft.), the specimens all distributed as var. *americanum* and so recorded by Fernald, Rhodora, xxviii. 117, 148 (1926).

Superficially *Athyrium alpestre*, var. *typicum* so strongly resembles *A. Filix-femina* (Willd.) Presl as readily to be mistaken for it; in fact, the two were both included by Linnaeus in his *Polypodium rhaeticum*. It is at once distinguished by its almost complete lack of an indusium (sometimes represented by a minute vestige), on which account the plant has found a place in *Polypodium* and *Phegopteris* and as a distinct genus, *Pseudathyrium*. Its fronds are firmer than in *A. Filix-femina*, almost coriaceous, and its spores are blackish and reticulated. Fronds of the European plant are shown in pl. 161 and 162, of the Newfoundland plant in pl. 165 and 166, the photographs most kindly made by Professor J. F. Collins.

Var. **gaspense**, n. var., frondibus elliptico-lanceolatis vel ovato-lanceolatis 2–7 dm. longis 0.7–2.5 dm. latis tripinnatis vel subquadri-

pinnatis, segmentis ultimis linearibus vel lineari-lanceolatis plerumque distantibus; soris 0.3–0.8 mm. diametro submarginalibus.—Northeastern region of the Table-top Range, Gaspé County, QUEBEC: crevices of granitic rock, altitude 750–1050 m., easterly and northerly slopes of Table-top Mountain, August 9, 1906, *Fernald & Collins*, no. 151 (small plants of exposed situation); forming extensive areas in alluvium of alpine brooks, easterly and northerly slopes of Table-top Mountain, August 9, 1906, *Fernald & Collins*, no. 151*a* (large plants up to 9 dm. high)—nos. 151 and 151*a* distributed as *Phegopteris alpestris* and cited by Butters as *A. alpestre*, var. *americanum;* alpine and subalpine meadows and brooksides at about 1100 m. alt., northeastern slope of Mt. Dunraven, August 2, 1923, *Fernald, Dodge & Smith*, no. 25,384 (TYPE in Gray Herb.); brooksides and meadows at about 975 m. alt., above the cascades, head of Gorge of Northeast Branch of Rivière Ste. Anne des Monts, August 5, 1923, *Fernald, Dodge & Smith*, no. 25,385; subalpine meadows on eastern base (alt. about 900 m.) of Mt. Au Clair, August 10, 1923, *Fernald & Smith*, no. 25,386; nos. 25,384–25,386 distributed as var. *americanum*.

The type-specimen, photographed by Professor Collins, is illustrated in pl. 168.

Var. AMERICANUM Butters, RHODORA, xix. 204 (1917), excluding plant of Quebec. *A. americanum* (Butters) Maxon, Am. Fern. Journ. viii. 120 (1918), where a type-specimen is designated (*Heacock*, no. 554).—Alaska to Colorado, Nevada and California.

The type-specimen is illustrated in pl. 167; other specimens in pl. 163 and 164.

EXPLANATION OF PLATES 161 TO 168

(Photographs by *J. F. Collins*)

161, ATHYRIUM ALPESTRE from Switzerland; 162, from Iceland. 163, A. ALPESTRE, var. AMERICANUM from Tulare Co., California, *Culbertson*, no. 9538; 164, from Tuolumne Meadows, California, *Smiley*, no. 810. 165 and 166, A. ALPESTRE from Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 27,243. 167, TYPE of A. ALPESTRE, var. AMERICANUM, from Selkirk Mts., British Columbia, *Heacock*, no. 554. 168, TYPE of A. ALPESTRE, var. GASPENSE, from Gaspé Co., Quebec, *Fernald, Dodge & Smith*, no. 25,384.

(To be continued.)

ATHYRIUM ALPESTRE FROM SWITZERLAND, × ⅓

ATHYRIUM ALPESTRE FROM ICELAND, × ⅓

ATHRYIUM ALPESTRE, VAR. AMERICANUM FROM CALIFORNIA, × $\frac{1}{3}$

ATHYRIUM ALPESTRE, VAR. AMERICANUM FROM CALIFORNIA. × 1/3

ATHYRIUM ALPESTRE FROM NEWFOUNDLAND, × ⅓

ATHYRIUM ALPESTRE FROM NEWFOUNDLAND, × $\frac{1}{3}$

TYPE OF ATHYRIUM ALPESTRE, VAR. AMERICANUM, × ⅓

TYPE OF ATHYRIUM ALPESTRE, VAR. GASPENSE, × ⅓

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXIX.

(*Continued from page 49.*)

VI. PRIMULA § FARINOSAE IN AMERICA

(Plate 169)

THE genus *Primula*, only slightly represented in America, but one of largest genera in the flora of Eurasia, is notoriously difficult of

classification. In America we know little of the complications which the student of the Eurasian flora must consider in untangling the species; but in the § *Farinosae* we have a slight illustration of these difficulties. This is best shown by the fact that the European *P. farinosa* L., which is apparently not found in America, has for more than a century held an undisputed, though changeable, position in our flora; and, although perfectly distinct species with natural geographic ranges, such as *P. mistassinica* Michx. (1803), *P. decipiens* Duby (1844), *P. incana* Jones (1895) and *P. specuicola* Rydb. (1913), have from time to time been set off, their authors have often stated that their new segregates were being distinguished from *P. farinosa*, which they believed to occur elsewhere in America.

Primula farinosa seems first to have been listed as a member of the American flora in 1813 when Muhlenberg[1] cited it as a Canadian plant with *white* corolla. Just what he referred to is not clear unless it were *P. mistassinica*, forma *leucantha*. *P. farinosa* was more definitely admitted to our flora by Nuttall[2] in 1818, as growing "On the calcareous gravelly shores of the islands of Lake Huron; . . . and . . . in the outlet of Lake Michigan," Nuttall's plant being really a species intermediate between *P. farinosa* and *P mistassinica*. In 1822 Torrey[3] again identified the plant of the shores of Lake Huron with *P. farinosa*, saying: "On a careful comparison of the American plant with specimens of *P. farinosa*, from Germany and Norway, I can find no difference except that the leaves are more *toothed* than *crenate* in the former"; and, on account of the leaves Torrey[4] later called the plant of Lakes Huron and Michigan *P. farinosa β. americana* but wrongly identified with it *P. pusilla* Goldie,[5] this time saying: "*Professor Hooker*, however, thinks the P. *pusilla* of *Goldie* to be very distinct from P. *farinosa;* though there can be no doubt that it is the plant described above." Goldie's *P. pusilla*, however, as shown by his description, illustration and locality (near Quebec), was a common broad-leaved phase of *P. mistassinica*, with which species it has subsequently been generally united; and it is not conspecific with the plant described by Torrey.

Gradually in America the conviction became firmly established, that *P. farinosa* has farinose lower leaf-surfaces and calyx, *P. mistas-*

[1] Muhl. Cat. 19 (1813).
[2] Nutt, Gen. i. 119 (1818).
[3] Torr. Am. Journ. Sci. iv. 59 (1822).
[4] Torr. Fl. No. and Mid. U. S. i. 213 (1824).
[5] Goldie, Edinb. Phil. Journ. vi. 322, t. xi, fig. 2 (1822).

sinica green and efarinose; and with this highly inconstant vegetative character as the leading difference the two are distinguished in recent manuals. In the *Synoptical Flora* Gray[1] so maintained *P. farinosa* for the farinose plants of the Gulf of St. Lawrence region (Labrador to Nova Scotia and eastern Maine), Lake Superior, the Rocky Mountains and southern South America (four quite distinct species) and merged them without question with the very different Eurasian plant; while, merely because of its efarinose quality, he placed under *P. mistassinica* the otherwise quite distinct *P. stricta* Hornem. of the arctic regions. In 1907, still clinging to the tradition that all plants with pronounced mealiness on the foliage or calyx are *P. farinosa* but not satisfied that the species was a unit, I suggested[2] the division of the American plant into typical *P. farinosa* and three varieties; var. *americana* Torr. (a species endemic on the shores of the upper Great Lakes), var. *macropoda* Fernald (a mixed series, but primarily based on the plant centering about the Gulf of St. Lawrence) and var. *incana* (Jones) Fernald, based on *P. incana* of the Rocky Mountains and Great Plains. But the most reactionary treatment is that of Pax & Knuth[3] in *Das Pflanzenreich,* where not only are *P. mistassinica* and *P. decipiens* ("*P. magellanica*") mingled with *P. farinosa,* but where *P. farinosa,* subsp. *eufarinosa,* var. *genuina* Pax is made to include, of course, true *P. farinosa* of Europe, but also the Rocky Mountain and Great Plain *P. incana* and (by citation of specimens) the species of the Gulf of St. Lawrence which I have called *P. farinosa,* var. *macropoda,* but which is really quite distinct from both the European and the Rocky Mountain species. Only a casual examination of typical European *P. farinosa,* the Great Plain and Rocky Mountain *P. incana* and the eastern American *P. farinosa,* var. *macropoda* is needed to show how artificial is a classification which makes the three species quite identical (subsp. *eufarinosa,* var. *genuina*!): European *P. farinosa,* a very slender plant with the subulate involucral bracts 4–7 mm. long, mostly only ½–⅓ as long as the filiform pedicels, the mature (fruiting) strongly ribbed calyx 4–6 mm. long, the corolla-lobes 4–6 mm. broad; *P. incana* coarser, with the lanceolate to linear-oblong flat involucral bracts 0.5–1 cm. long, mostly nearly equaling to exceeding the short and stout flowering pedicels, the mature calyx 8–10 mm.. long and only obscurely ribbed,

[1] Gray, Syn. Fl. ii. pt. 1: 58 (1878).
[2] Rhodora, ix. 15, 16 (1907).
[3] Pax & Knuth in Engler, Pflanzenr. iv[237]. Primulaceae (1905).

the corolla-lobes 2–3 mm. broad; *P. farinosa*, var. *macropoda*, a coarse plant with subulate involucral bracts 0.5–1.4 cm. long and with stout pedicels, the mature almost ribless calyx 5.5–11 mm. long, the corolla-lobes 3.5–5.5 mm. broad.

Or again, the essentially Canadian *Primula mistassinica*, which superficially more closely simulates *P. farinosa* than do the other species, but which has consistently different seeds, is a very delicate and slender plant with subulate involucral bracts only 2–6 mm. long, elongate filiform pedicels, mature calyx 3–6 mm. long and only 2–3.5 mm. in diameter, and tiny smooth or obscurely reticulated seeds rarely 0.5 mm. long (European *P. farinosa* with coarser and conspicuously pebbled or reticulated seeds); but the Magellanic species (included by Pax & Knuth along with the Canadian *P. mistassinica* under *P. farinosa*) is stout (scapes up to 4 mm. thick), with flat lanceolate involucral bracts 6–10 mm. long, umbel almost capitate owing to the abbreviated stout pedicels, mature calyx about 1 cm. long and 5 mm. in diameter, and with the largest seeds of the section, fully 1 mm. long and covered with long and conspicuous murications. That as plants *P. mistassinica* and the coarse plant of southern South America are not conspecific is perfectly apparent and their inclusion along with *P. incana* and others in *P. farinosa* by Pax & Knuth is due to the reliance by those authors upon single key-characters, rather than upon the sum-total of characters which really mark the different species but which, throughout their work, they largely ignore.

The result of reliance upon single, and almost exclusively vegetative, characters is inevitably either under-classification, such as has just been illustrated, or over-classification and the complete segregation in a treatment of plants which are really closely related or even of individuals of a single species. The sections of *Primula* defined by Pax and Knuth well illustrate this difficulty. Thus, the only character given by them in *Das Pflanzenreich* for the § *Minutissimae* (3 species of Thibet and the Himalaya) is "Species stoloniferae," the succeeding 16 sections (including § *Farinosae*) being "Species astolonae." Nevertheless, *P. mistassinica* (included by them under *P. farinosa*) may sometimes develop flagelliform and leafy stolons up to 7 cm. long! Again, § *Farinosae* is distinguished from all the 8 succeeding sections by "Bracteae involucrales basi gibbosae vel saccato-productae," yet *P. farinosa* and four others in the section

are promptly grouped together because they have "Bracteae basi vix gibbosae." Based upon single characters, such as are above illustrated, the sections and keys to species of *Das Pflanzenreich* are perplexing and contradictory in the extreme; and it is impossible to avoid the conviction that a vast reduction and reorganization will be necessary before *Primula* attains a natural classification. The *Farinosae* in America are certainly real entities and when their different characters are closely studied they resolve themselves very satisfactorily into species with definite combinations of characters, especially of flowers, fruits and seeds, and with clearly defined and natural geographic ranges. As a result of an intensive study of this small group extending over several weeks the following treatment of the American species is proposed as at least some advance over the treatments heretofore available, although, on account of poor material, it is still necessary to treat two or three plants in a tentative and, therefore, unsatisfactory manner.[1]

Besides the material in the Gray Herbarium and the herbarium of the New England Botanical Club, I have had the great advantage of examining the splendid series of specimens in the National Herba-

[1] One species of § *Nivales* and, therefore, not included in the following synopsis is not generally passing under its earliest specific name and should have its nomenclature clarified. This is the species treated by Gray in the *Synoptical Flora* as *P. nivalis* Pallas. Subsequently, it has been repeatedly shown that the plants of the Bering Sea region are quite distinct from Pallas's species of central and western Asia; but the characters relied upon by Pax and by Greene to separate the Bering Sea plant into two species do not hold. Thus Pax, following Greene, distinguished *P. eximia* Greene from *P. pumila* (Ledeb.) Pax by "Corollae lobi . . . acuti, non emarginati" as contrasted with "Corollae . . . lobi . . . retusi vel leviter emarginati vel integri" in *P. pumila;* but Mrs. Busch's beautiful plate shows them both with obtuse and strictly entire summits, while specimens from the type-station, St. Paul's Island, show conclusively that the lobes of *P. eximia* may be definitely emarginate. Differing only in size of parts the two are apparently not separate species, but they are well marked varieties and Mrs. Busch so treats them. She fails, however, to take up the earliest specific name, not apparently because it is of difficult pronunciation, but because she consistently retains the oldest name of whatever rank and consequently adhers to *P. pumila* (Ledeb.) Pax. By the International Rules the names of the two varieties are

P. Tschuktschorum Kjellm., var. **pumila** (Ledeb.), n. comb. *P. nivalis*, γ. *pumila* Ledeb. Fl. Ross. iii. 10 (1847–49). *P. nivalis* Gray, Syn. Fl. N. A. ii. pt. 1: 59 (1878), not Ledeb. *P. Tschuktschorum* Kjellm. in Nordensk. Vega-Exp. Vetensk. Jagtt, i. 516, t. ix. (1882) in part, and Wissenschaftl. Ergebn. Vega-Exped. 331, t. 5 (1883). *P. pumila* (Ledeb.) Pax, Engler's Bot. Jahrb. x. 208 (1889). *P. pumila*, var. *Ledebouriana* E. Busch, Fl. Sib. et Orient. Extr. Cem. 65: 75, fig. B (1926).

Var. **arctica** (Koidzumi), n. comb. *P. nivalis* Gray, Syn. Fl. N. A. ii. pt. 1: 59 (1878) in part, not Ledeb. *P. eximia* Greene, Pittonia, iii. 251 (1897); J. M. Macoun in Fur Seals and Fur-Seal Isl. N. Pacif. Oc. iii. 568, t. xcii. (1899). *P. Macounii* Greene, l. c. 251, 260 (1897); J. M. Macoun, l. c. 569, t. xciii (1899). *P. arctica* Koidzumi, The Bot. Mag. (Japan), xxv. 216 (1911). *P. pumila*, var. *arctica* (Koidzumi) E. Busch, Fl. Sib. et Orient. Extr. Cem. 65: 75, fig. A (1926).

rium of Canada (cited as "Can.") kindly placed at my disposal by Dr. Malte, and the Primulas in the herbaria of the University of Minnesota (cited as "Minn.") generously loaned by Dr. Butters, and of the University of Pennsylvania submitted by Mr. Fogg.

Key to American Species of Primula § Farinosae

a. Bracts of involucre subulate, lanceolate or linear-oblong above the dilated base, tapering gradually to the tip; their bases either gibbous, rounded or tapering, rarely much prolonged —*b.*

b. Leaves mostly dentate or at least distinctly crenate, petioled or merely narrowed to base, farinose or efarinose: limb of corolla 0.5–2 cm. across: mature capsule from shorter than to at most twice as long as the calyx, thick-cylindric to ellipsoid-ovoid, 2–5 mm. in diameter: seeds dark-brown or fulvous, smooth or rough—*c.*

c. Comparatively stout plants: scape 0.6–4 mm. in diameter just below the involucre, excluding the umbel 0.1–4.5 dm. high: involucral bracts 0.3–1.4 cm. long: pedicels 0.4–1 mm. in diameter: mature calyx 3.8–11 mm. long, 2.5–6 mm. in diameter at summit of tube: anthers and stigma overtopped by the corolla-tube, not exserted from the throat of the shrivelled corolla: capsules 2.5–5 mm. in diameter: seeds muricate or distinctly reticulated (cf. no. 6), 0.5–1 mm. long—*d.*

d. Lobes of mature calyx obtuse to acute but not subulate-tipped: corolla-tube 4–7 (rarely –9) mm. long; lobes shallowly emarginate to deeply obcordate: capsule equaling to exceeding the calyx—*e.*

e. Bracts of involucre subulate or tightly involute above the dilated base.

Leaves green beneath, very rarely a little farinose, subentire or obscurely undulate-dentate, 0.5–4 cm. long, 0.2–1.5 cm. broad: mature calyx 3.8–6 mm. long, efarinose or only scantily farinose; the lobes about half as long as the tube: limb of corolla 5–8 mm. broad; lobes oblong or narrowly cuneate, 1–3 mm. broad, shallowly emarginate, the segments 0.2–1 mm. long ..... 1. *P. stricta.*

Leaves strongly farinose (rarely efarinose) beneath, mostly dentate, 1–13 cm. long, 0.3–3 cm. broad: mature calyx 5.5–11 mm. long, usually strongly farinose; lobes about equaling the tube: limb of corolla 9–13 mm. broad; lobes broadly obcordate, 3.5–5.5 mm. broad, with segments 1.5–3 mm. long ..... 2. *P. laurentiana.*

e. Bracts of involucre lanceolate to linear-oblong, flat (slightly involute only on drying).

Calyx copiously farinose; the oblong obtuse or rarely acutish lobes shorter than the tube: corolla-tube slightly exceeding the calyx; limb 6–10 mm. broad, lilac, with oblong to cuneate-obovate lobes 2–3 mm. broad: capsule only slightly exceeding the calyx: seeds 0.5–0.7 mm. long, strongly angled ..... 3. *P. incana.*

Calyx efarinose or only sparingly farinose; the oblong-lanceolate acute to obtuse lobes equaling the tube: corolla-tube shorter than to barely equaling the calyx; its white (rarely lilac-tinged) limb 1.2–2 cm. broad, with lobes 3.5–6 mm. broad: capsule distinctly exceeding the calyx: seeds 1 mm. long, rounded-obovoid.....4. *P. decipiens.*

d. Lobes of mature calyx sharply acuminate to subulate-tipped: corolla-tube 8–10 mm. long; its limb 6–10 mm. broad, with the narrowly cuneate lobes merely emarginate: capsule much overtopped by the calyx-lobes.....5. *P. specuicola.*

c. Comparatively slender: scapes 0.3–1.8 mm. in diameter just below the involucre, excluding the umbel 0.1–2.5 dm. high: involucral bracts 2–6 mm. long: pedicels 0.2–0.5 mm. in diameter: mature calyx 3–6 mm. long, 2–3.5 mm. in diameter at summit of tube: stigma or tops of anthers exserted from the throat of the shrivelled corolla: capsule 2–3 mm. in diameter: seeds smooth or only obscurely reticulated (strongly reticulated in no. 6), 0.3–0.6 mm. long—*f.*

f. Most of the leaves merely cuneate at base or narrowed gradually to the broad subpetiolar base, with 2–15 pairs of teeth: involucral bracts rarely saccate-gibbous at base—*g.*

g. Seeds strongly angulate and truncated, prominently rugose or reticulated: leaves often farinose beneath. 6. *P. intercedens.*

g. Seeds rounded-obovoid, nearly smooth or obscurely linear-reticulated.

Leaves copiously farinose beneath, somewhat rhombic: pedicels and calyx farinose.....7. *P. ajanensis.*

Leaves green, very rarely farinose, oblanceolate to obovate: pedicels efarinose: calyx usually efarinose.....8. *P. mistassinica.*

f. Most of the leaves with petioles longer than the rather abruptly dilated rhombic, ovate or cuneate-obovate blades; the blades with few (1–7) pairs of teeth confined to the upper half or entire.

Corolla-limb 7–10 mm. broad; its emarginate to obcordate lobes 1.5–3 mm. broad: involucral bracts not saccate at base.....9. *P. parvifolia.*

Corolla-limb 1.2–2 cm. broad; its deeply obcordate lobes 5–8 mm. broad: involucral bracts usually saccate-gibbous at base.....10. *P. borealis.*

b. Leaves entire, undulate or rarely slightly dentate, distinctly slender-petioled, efarinose: limb of corolla 5–9 mm. broad, white or violet; its cuneate lobes distinctly shorter than the tube, 1.6–4 mm. broad, cleft a third or half their length: mature capsules slender-cylindric, tapering at summit, becoming 2–3 times as long as the calyx, 7–13 mm. long, 1.8–2.1 mm. in diameter: seeds pale-brown to stramineous, smooth.....11. *P. egaliksensis.*

a. Bracts of involucre oblong or narrowly obovate, obtuse or abruptly contracted at tip; their bases often prolonged into narrow saccate auricles 1–1.5 mm. long: leaves slender-petioled, entire.....12. *P. sibirica.*

1. P. STRICTA Hornem. *Leaves green*, or only sparingly farinose beneath, oblanceolate to narrowly obovate, *entire to obscurely undulate-dentate*, 0.5–4 cm. long, 0.2–1.5 cm. broad: *scape* 1.5–30 cm. high, rather strict and stout, *1–2 mm. in diameter* below the inflorescence, green or purplish and *efarinose: involucral bracts lance-subulate*, usually saccate or gibbous at base, *3–8 mm. long:* umbel 2–8-flowered: pedicels erect or nearly so, in anthesis from shorter than to twice as long as the bracts: *calyx* urceolate-campanulate, *efarinose, in maturity 3.8–6 mm. long, 3.5–5 mm. in diameter* at summit of tube; the *lobes* oblong to narrowly deltoid, obtuse to acute, *about half as long as the tube: corolla* lilac or violet; the *tube distinctly exserted; the limb 5–8 mm. broad; lobes oblong to narrowly cuneate, 1–3 mm. broad*, shallowly notched, the *segments 0.2–1 mm. long; capsule* ellipsoid, *only slightly exceeding the calyx*, 3–4 mm. in diameter: seeds more or less angulate, dark-brown or fulvous, 0.5–0.8 mm. long, conspicuously reticulated. —Hornem. in Fl. Dan. viii. fasc. 24, t. mccclxxxv. (1810); Duby in DC. Prodr. viii. 44 (1844); Lange, Consp. Fl. Groenl. 70 (1880); Pax & Knuth in Engler, Pflanzenr. iv[237]. 86 (1905); J. M. Macoun & Holm, Rep. Can. Arct. Exped. 1913–18, v. pt. A. t. xi. fig. 6 (1921); E. Busch, Fl. Sib. et Orient. Extr. iv. Cem. 65: 38 (1926). *P. farinosa, β. stricta* (Hornem.) Wahlenb. Fl. Lapp. 60 (1812). *P. Horneman niana* Lehm. Monogr. Prim. 55, t. 4 (1817); Hook. Fl. Bor.-Am. ii. 120 (1838), in small part only. *P. glabrescens* F. Nylander ex W. Nyl. & Saelan, Herb. Mus. Fenn. (1859) 32, acc. to Pax & Knuth. *P. mistassinica* Gray, Syn. Fl. N. A. ii. pt. 1: 58 (1878) in part, not Michx. (1803). *P. farinosa*, var. *mistassinica* Pax, Engler's Bot. Jahrb. x. 200 (1889) in part, not *P. mistassinica* Michx. (1803). *P. farinosa*, var. *groenlandica* Pax in Engler, Pflanzenr. iv[237]. 84 (1905) in part, not *P. stricta*, var. *groenlandica* Warming (1886). *P. farinosa*, var. *macropoda* Fernald, RHODORA, ix. 16 (1907) in small part (as to citation of Keewatin plant). *P. stricta* var. *jacutensis* E. Busch, Fl. Sib. et Orient. Extr. iv. Cem. 65: 36 (1926).—Arctic and subarctic Eurasia, Greenland and North America; with us south to northern Labrador, northwestern Quebec, northern Ontario and Alberta. The following American specimens have been examined. GREENLAND: without locality, ex *Lehmann;* Umenak, *Rink;* Atâ, lat. 70° 16′, August 6, 1921, *A. E. Porsild;* Qeqerlatik Najarsuit, lat. 66° 44′, August 3, 1911, *M. P. & A. E. Porsild;* Kügsinerssuaq and Atâ, lat. 70° 17′, July 11, 1923, *M. P. Porsild;* Itivdleq-Fjord, Quingua, lat. 66° 29′, July 6, 1926, *M. P. Porsild;* the Porsild specimens all distributed as *P. mistassinica.* LABRADOR: moist banks, Nachvak, *R. Bell*, no. 15,829 (Can.), as *P. mistassinica;* Rama, *A. Stecker*, no. 78, as *P. farinosa.* QUEBEC: Ungava ("northern Labrador"), 1884, *L. M. Turner*, July, 1897, *A. P. Low*, no. 24,529 (Can.), as *P. egaliksensis;* River Kovik, lat. 61° 59′, Hudson Straits, *Low*, no. 23,025 (Can.), as *P. farinosa;* Richmond Gulf, June 28, 1890, *Spreadborough*, no. 14,421, June 12, 1899, *Low*, no. 63,242 (Can.), both as *P. sibirica;*

north of Cape Jones,[1] James Bay, *A. P. Low*, no. 63,244, as *P. stricta*, altered to *P. sibirica;* damp banks, South Twin Island, James Bay, *J. M. Macoun*, no. 15,831 (Can.), as *P. farinosa.* ONTARIO: "growing below high-water mark," west coast of Hudson Bay, lat. 56°, August, 1886, *J. M. Macoun*, no. 15,850 (Can.), as *P. mistassinica* or *P. sibirica;* Cape Henrietta Maria, *Spreadborough*, no. 62,555 (Can.); mouth of Ekwan River, James Bay, *Dowling*, no. 34,526 (Can.), as *P. farinosa;* The Beacon, mouth of Moose River, *Spreadborough*, no. 62,554 (Can.), as *P. sibirica.* MANITOBA: Churchill, lat. 58° 50′, *J. M. Macoun*, no. 79,388, as *P. stricta* or *P. farinosa;* Churchill River, *C. E. Cairnes*, no. 89,722 (Can.), as *P. mistassinica.* MACKENZIE: Arctic seacoast, *Richardson;* Mackenzie River, *Richardson;* south coast of Coronation Gulf, Port Epworth, *Cox & O'Neill*, no. 581; Bernard Harbour, *Frits Johansen*, no. 347; Great Bear River, *Elizabeth Taylor*, no. 87; shore, Great Slave Lake, *R. Bell*, no. 23,151 (Can.). YUKON: near mouth of Lewis River, *Gorman*, no. 1052 (Can.). ALBERTA: Rocky Mountains, *Drummond*, as *P. farinosa* or *P. scotica;* head of Pabocton Trail, *S. Brown*, no. 1107, as *P. borealis.*

The Greenland and American plants cited seem to me quite inseparable from Scandinavian material of typical *P. stricta*, although the tiny plants from the Arctic coast of Mackenzie might be set off as var. *jacutensis* E. Busch; they agree closely with Mrs. Busch's description and figure of the plant of northeastern Siberia, but seem more like dwarfed arctic extremes than a true variety.

Pax & Knuth exclude *P. stricta* from America and cite all Greenland and Labrador material under *P. farinosa*, var. *groenlandica*, which they base upon *P. stricta*, var. *groenlandica* Warming, Svensk. Vet. Akad. Handl. xii. Afd. iii. No. 2: 21, fig. 7, A–D (1886). Lange, Conspect. Fl. Groenl. 260 (1887), however, maintained both *P. stricta* and *P. stricta*, var. *groenlandica* Warm. in the Greenland flora, remarking that the latter is a "Forma intermedia inter P. strictam et P. egaliksensem." Surely, the figures of var. *groenlandica* published by Warming are of a plant scarcely, if at all, separable from *P. egaliksensis.* The distinctly petioled leaf with abruptly dilated entire blade, the large and plane involucral bracts, short flowering pedicels, comparatively slender calyx with narrow lobes, only slightly exserted corolla-tube with deeply-notched lobes are all characters of *P. egaliksensis* and Warming's figures are readily matched in that species, but not in *P. stricta.* In fact, Warming's

[1] The material is labeled in the hand of the late J. M. Macoun "North of Cape Jones, Hudson Strait"; but Low's report for 1899, when it was collected, explicitly refers to "Cape Jones at the entrance to James Bay"—See Low, Geol. Surv. Can. Ann. Rep. n. s. xii. 144A (1902).

figures are not appreciably unlike the original plate of the white-flowered *P. egaliksensis* Wormsk. in Hornem. Fl. Dan. ix. fasc. 26: t. mdxi. (1816), except that *P. stricta*, var. *groenlandica* has purple corollas. Just such a plant occurs across boreal America, in northern Newfoundland, northern Quebec, Alberta, British Columbia and Alaska; and of the abundant series which I have collected and studied in Newfoundland (six numbers, representing all stages from young flowers to mature fruit) the smaller specimens exactly match Warming's original figures of *P. stricta*, var. *groenlandica* and, better still, the four individuals in the Gray Herbarium of his type collection, gathered at Itivnek-Elvens in the Holstensborg District of Greenland on July 13, 1884. The Newfoundland plant with violet corollas, watched closely in the field, can be separated from typical white-flowered *P. egaliksensis* only by its intense color. Its fruit, collected at a specially marked station, is quite like that of *P. egaliksensis*, except that the capsules are deeper-colored: the slenderly cylindric capsules 2–3 times as long as the calyx and only 1.5–1.8 mm. thick (the capsules of *P. stricta* ellipsoid, only slightly exceeding the calyx and 3–4 mm. in diameter; the capsules of *P. farinosa* likewise ellipsoid, only slightly exserted and thick). Furthermore, in both *P. farinosa* and *P. stricta* the dark-brown seeds are obviously muricate or reticulated, in P. *egaliksensis* the stramineous or pale-brown seeds smooth or at most obscurely reticulated; and the seeds of *P. stricta*, var. *groenlandica* are like those of *P. egaliksensis*. It is now very clear, then, that *P. stricta*, var. *groenlandica* Warming belongs neither to *P. stricta* with which he placed it not to *P. farinosa* to which it was transferred by Pax & Knuth, but that it is a variation of *P. egaliksensis*, as Lange has already suggested. It is, furthermore, clear that most of the material cited by Pax & Knuth under *P. farinosa*, var. *groenlandica* really belongs to *P. stricta*.

2. P. **laurentiana**, Fernald, nom. nov. (Plate 169). *Leaves farinose* (rarely efarinose) *beneath*, oblanceolate, spatulate or narrowly rhombic-ovate, *mostly* petioled and *dentate*, 1–13 cm. long, 0.3–3 cm. broad: *scape* 0.1–4.5 dm. high, strict and stout, *0.6–3 mm. in diameter* below the inflorescence, *often farinose at summit: involucral bracts lance-subulate or strongly involute*, usually strongly saccate or gibbous at base, *0.5–1.4 cm. long:* umbel 1–17-flowered: pedicels erect or strongly ascending, from practically wanting to 5 cm. long, comparatively stout (up to 1 mm. thick): *calyx* urceolate-campanulate, *usually farinose, in maturity 5.5–11 mm. long and 3–6 mm. in diameter* at summit of tube; the *lobes* lanceolate, oblong or narrowly deltoid,

obtuse to acute, *about equaling the tube: corolla* lilac; the *tube but slightly exserted; the limb 9–13 mm. broad; lobes broadly obcordate, 3.5–5.5 mm. broad, with segments 1.5–3 mm. long:* style and anthers not exserted from the yellow throat: capsule ellipsoid, from slightly exserted to twice as long as the calyx, 2.5–5 mm. in diameter; its valves splitting into linear halves 1.5–2 mm. wide: seeds angulate, 0.5–0.8 mm. long, conspicuously reticulated: flowers with the fragrance of *Narcissus Jonquilla;* roots musky.—*P. pusilla* Sweet, Brit. Fl. Gard. ser. 2, i. t. 5 (1831), not Goldie (1822). *P. farinosa* var. *macropoda* Fernald, Rhodora, ix. 16 (1907) mostly, including the type-specimen, not *P. macropoda* Craib, Notes Roy. Bot. Gard. Edinb, xi, 176 (1919). *P. scotica* Hook. Fl. Bor.-Am. ii. 120 (1838), not Hook. in Curt. Fl. Lond. iv. t. 133 (1821). *P. farinosa,* var. *genuina* Pax in Engler, Bot. Jahrb. x. 199 (1889) as to eastern American citations. *P. farinosa,* subsp. *eufarinosa,* var. *genuina* Pax & Knuth in Engler, Pflanzenr. iv[237]. 83 (1905), as to citation of eastern Canadian plant. *P. farinosa,* var. *americana* Fernald, Rhodora, xxviii. 224 (1926), not Torr. Fl. No. and Mid. U. S. i. 213 (1824). *P. farinosa,* var. *incana* St. John, Can. Dept. Mines. Mem. no. 126: 104 (1922); Fernald, Rhodora, xxviii. 224 (1926); not var. *incana* (Jones) Fernald Rhodora, ix. 16 (1907). *P. farinosa* of eastern Am. authors, not L. (1753).—Ledges and cliffs, chiefly calcareous, southern Labrador to Nova Scotia and eastern and north-central Maine. The following, selected from many specimens, are characteristic. Labrador: banks of Naskaupi River, about 18 miles from mouth, *Wetmore,* no. 103,037; Indian Harbor, lat. 54° 27′, *Ralph Robinson,* no. 102; Battle Harbor, *Bowdoin College Exped.* no. 104; Barge Point, July 17, 1913, *W. E. Ekblaw;* Forteau, 1870, *S. R. Butler.* Newfoundland: turfy limestone barrens, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss,* no. 28,905; gravelly limestone shore, Schooner (or Brandy) Island, *Pease & Long,* no. 28,907; wet limestone ledges, St. Barbe, *Fernald, Long & Dunbar,* no. 26,956; talus of calcareous sandstone escarpments, Bard Harbor Hill, *Fernald & Long,* no. 28,912; calcareous rocks and talus, Port Saunders Harbor, *Fernald & Wiegand,* no. 3889; conglomerate limestone, etc., Cow Head, *Fernald & Wiegand,* nos. 3885, 3887; boggy spots on rocky crests, Twillingate, *Fernald, Wiegand & Bartram,* no. 6068; dry sea-cliffs, Tilt Cove, *Fernald, Wiegand & Darlington,* no. 6069; bare spots, French (or Tweed) Island, *Fernald, Long & Fogg,* no. 375; cliffs near Frenchman's Cove, Bay of Islands, *Mackenzie & Griscom,* no. 10,402; calcareous gravelly bank, Port au Port, *Fernald & Wiegand,* no. 3886. Quebec: limestone and calcareous sandstone terraces, Blanc Sablon,[1] *Fernald & Wiegand,* nos. 3888, 3890, *Fernald, Wiegand & Long,* no. 28,914; grassy shore, Wapitagun, July 14, 1927, *H. F. Lewis* (Can.); rocky shore, Goynish, *St. John,* no. 90,675; limestone headland,

[1] The original labels read "Labrador," but by recent decision of the Privy Council Blanc Sablon is transferred to Quebec.

Pointe-aux-Esquimaux, Mingan, *St. John*, no. 90,674; plages calcaires de la petite rivière, Pointe-aux-Esquimaux, *Victorin & Rolland*, no. 18,485; sur les calcaires du rivage, Ile à Marteau, Mingan, *Victorin & Rolland*, no. 18,565; sur les rivages calcaires, Grande Ile, Mingan, *Victorin & Rolland*, no. 21,832; Baie Ellis, Anticosti, *Victorin*, no. 4188; alluvion argilo-calcaire, Rivière Jupiter, Anticosti, *Victorin & Rolland*, no. 25,139; Salt Lake, Anticosti, *J. Macoun*, no. 15,833 (Can.); Bonaventure conglomerate (calcareous) sea-cliffs, Bonaventure Island, *Fernald & Collins*, no. 1148, *Victorin et al*, nos. 17,642, 17,644; cliffs and ledges, Percé, *J. M. Macoun*, no. 68,949 (Can.), *Collins, Fernald & Pease*, nos. 5319, 5320, 5434, 5435, 5554, *Fernald & Collins*, nos. 1147, 1149; sur les calcaires, Anse à l'Indien, *Victorin, Rolland, Brunel & Rousseau*, no. 17,643; limestone cliffs, Cape Rosier, *Frits Johansen*, no. 103,287 (Can.); calcareous sea-cliffs, Christie, *Fernald & Pease*, no. 25,233; sea-cliffs, Tourelle, *Griscom, Mackenzie & Smith*, no. 25,981; calcareous sea-cliffs, Jaco Hughes, *Fernald & Pease*, no. 25,232; wooded banks of the St. Lawrence, Matane, August 7, 1904, *F. F. Forbes;* shaded calcareous cliffs, Bic, *Fernald & Collins*, nos. 243 (TYPE in Gray Herb.), 1146; wet shore of the St. Lawrence, Temiscouata, August 7, 1879, *Pringle;* Pointe à Persil, Rivière du Loup, *Victorin*, no. 131. MAGDALEN ISLANDS: Entry Island, June 23, 1861, *Hyatt, Verrill & Shaler*. NOVA SCOTIA: dripping cliffs, Baxter's Harbour, July 10, 1900, *F. G. Floyd;* cliffs and ledges, Morden, *W. H. Harrington*, no. 644 (Can.); crests of basalt cliffs by Bay of Fundy, near Margaretville, *Bissell, Bean, White & Linder*, no. 22,234; turfy crests and slopes of exposed headlands, Markland (Cape Forchu), *Fernald, Bartram, Long & Fassett*, no. 24,327; Chebogue Point, *John Macoun*, no. 81,152. MAINE: Houlton, 1880, 1881, *Kate Furbish;* foot of Mt. Kineo, Moosehead Lake, August, 1866, *A. H. & C. E. Smith;* north side of Mt. Kineo, September 21, 1887, *G. G. Kennedy;* gravel, Libby Islands, Machiasport, *Cushman & Sanford*, no. 1515.

P. laurentiana is the plant published originally as *P. farinosa*, var. *macropoda*. On account of *P. macropoda* Craib it is necessary to assign a new name. It is a coarser plant than the European *P. farinosa* to which it has always been referred, either as identical or as a geographic variety. The dwarf northern extremes (from southern Labrador and northern Newfoundland) simulate *P. farinosa* and have often been mistaken for it, but in its typical development, *P. laurentiana* is taller and stouter; the bracts of the involucre longer, 0.5–1.4 cm. long (in European *P. farinosa* 4–7 mm. long); the pedicels stouter; the calyx commonly much more farinose, urceolate-campanulate, in fruit 5.5–11 mm. long and 3–6 mm. in diameter (the efarinose to but slightly farinose calyx of *P. farinosa* more turbinate,

in fruit only 4–6 mm. long and 2.5–4 mm. in diameter); the capsules larger and the seeds with more conspicuous reticulation. Plate 169 is from a photograph taken at the type-station by Professor J. F. Collins.

In view of the pronounced selection of calcareous habitats by *P. laurentiana* it is worth noting that Contejean classified the European *P. farinosa* as one of the "*Calcifuges presque indifférentes, cependant plus nombreuses sur les sols privés de calcaire;*"[1] and that Warming indicates[2] *P. farinosa* as a typical oxylophyte, listing it along with *Vaccinium uliginosum* and *V. Oxycoccus.* On the other hand, Tansley makes *Primula farinosa* in Great Britain distinctly calcicolous, saying, "*Actaea spicata* and *Primula farinosa* also seem to have found the siliceous soils of the Leeds and Halifax district an effectual barrier against a southern extension of their range";[3] and he definitely lists it as one of the characteristic plants which "On the Pennines, for example, . . . occur on the swamps of the limestone hills."

In *P. laurentiana* the pedicels are commonly elongate, but at the northern part of its range they may be very short or almost wanting. These specimens with abbreviated pedicels have been confused with the Great Plain and Rocky Mountain *P. incana,* but they differ from that species in their involucral bracts, broad corolla-lobes, and other characters which show them to be merely dwarfed states of *P. laurentiana.* Other plants of *P. laurentiana* with unusually small calyces and capsules have sometimes been identified with the plant of the Great Lakes which Torrey described as *P. farinosa,* var. *americana;* but the Great Lake material, though often quite farinose (and thus strongly simulating *P. farinosa* and *P. laurentiana*) has a technical character which allies it as much to *P. mistassinica:* the capitate stigma or the tops of the anthers protruding from the throat of the shrivelling corolla. The plants of Newfoundland and Quebec which have been misidentified with *P. farinosa,* var. *americana* are clearly only attenuate forms of *P. laurentiana.* The plants of Mt. Kineo, Maine are extreme cases of this attenuation; the leaves being remarkably thin and delicate, the scapes unusually slender, and the small calyces with unusually thin and sharp lobes; but these seem to be only slight ecological modifications, presumably due to the habitat,

[1] Contejean, *Influence du Terrain sur la Végétation,* Ann. Sci Nat. sér. 6. ii. 300 (1875).

[2] Warming, Oecology of Pl. ed. Groom & Balfour. 193 (1909).

[3] Tansley, Types of British Vegetation, 157 (1911).

at the foot of a north-facing precipice rather than in more exposed and better illuminated spots, such as the plant usually selects.

Ordinarily *P. laurentiana*, like *P. farinosa* and *P. incana*, has the lower surface of the leaf strongly farinose or whitened with waxy particles. When the specimens have been dried over extreme heat or when immersed in alcoholic solutions in poisoning, the wax is often removed and the leaves have a deceptive post-mortem greenness. Occasionally, however, considerable colonies of *P. laurentiana* are found with absolutely green and efarinose foliage; and, unless their characters of calyx, corolla, capsule and seeds are carefully examined, they are likely to be misidentified either as *P. stricta*, which is high-northern, or with *P. mistassinica*, which abounds through much of the range of *P. laurentiana* but which has more slender scapes and pedicels, calyx and capsules, shorter bracts and smaller and only obscurely pebbled seeds. The green form of *P. laurentiana* is apparently parallel with *P. farinosa*, var. *denudata* Koch of Europe. It is merely a minor form, but as a striking variation, may appropriately be designated

P. LAURENTIANA, forma **chlorophylla**, n. f., foliis subtus efarinosis.—NEWFOUNDLAND: Cape Norman, *Wiegand & Long*, no. 28,909; Sacred Island, *Wiegand, Gilbert & Hotchkiss*, no. 28,908; Sandy (or Poverty) Cove, *Fernald, Long & Dunbar*, no. 26,955; Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,957; Yankee Point, *Wiegand & Hotchkiss*, no. 28,904; turfy limestone barrens, Dog Peninsula, August 27, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,913 (TYPE in Gray Herb.); Bard Harbor, *Fernald & Long*, no. 28,911. QUEBEC: Anticosti Island, *Pursh;* Ilets Perroquets, Mingan, *Victorin & Rolland*, no. 18,421; wet mossy swale, Puffin Island, St. Mary Islands, July 27, 1927, *H. F. Lewis* (Can.). MAINE: base of Kineo Cliff, Moosehead Lake, July 24, 1866, August, 1867, *A. H. & C. E. Smith* (Penn.), June 8, 1878, *F. S. Bunker*.

3. P. INCANA Jones. *Leaves* strongly (rarely only slightly) *farinose beneath*, elliptic, oblong-obovate or spatulate, without petioles or in attenuated plants with winged petioles, obtuse, *shallowly denticulate*, 1.5–8 cm. long, 0.5–2 cm. broad: *scape* 0.5–4.5 dm. high, strict and stout, *1–2 mm. in diameter* below the inflorescence, *farinose at summit: involucral bracts lanceolate to linear-oblong, flat* (slightly involute only on drying), broadly gibbous at base, 0.5–1 cm. long, *mostly equaling or exceeding the short* and stout *flowering pedicels: umbel* 2–14-flowered, *subcapitate*, but with some fruiting pedicels elongating to 1–2.5 cm. long: *calyx* urceolate-campanulate, usually *strongly farinose*, in maturity 8–10 mm. long and 4–5 mm. in diameter; the *oblong* obtuse or rarely acutish *lobes shorter than the tube: corolla* lilac; the *tube*

slightly exceeding the calyx; the limb 6-10 mm. broad, with oblong to cuneate-obovate lobes 2–3 mm. broad; stigma and anthers not exserted from the yellow throat: *capsule* ellipsoid, *only slightly exceeding the calyx: seeds strongly angled, 0.5–0.7 mm. long, conspicuously reticulated.* —Proc. Cal. Acad. ser. 2, v. 706 (1895). *P. farinosa,* var. Gray, Proc. Acad. Nat. Sci. Phila., 1863: 70 (1863). *P. dealbata* Engelm. in Gray, l. c. (1863) as synonym. *P. americana* Rydb. Bull. Torr. Bot. Cl. xxviii. 500 (1901). *P. farinosa,* var. *genuina* Pax, in Engler's Bot. Jahrb. x. 199 (1889) in part, as to Rocky Mt. material. *P. farinosa,* subsp. *eufarinosa,* var. *genuina* Pax & Knuth in Engler, Pflanzenr. iv[237]. 83 (1905), as to synonymy in part and citation of Colorado material. *P. farinosa,* var. *incana* (Jones) Fernald, Rhodora, ix. 16 (1907). *P. farinosa,* var. *macropoda* Fernald, Rhodora, ix. 16 (1907) in small part (as to plants of Saskatchewan, Athabasca and Mackenzie). Illustrated as *P. farinosa* in Clements & Clements, Rocky Mt. Flowers, t. 16, fig. 1 (1914) and by McCalla, Wild Fl. W. Can. 37 (1920).—Meadows, bogs and damp places, Mackenzie to Colorado and Utah. Mackenzie: Great Slave Lake, *Richardson.* Saskatchewan: without locality, 1858, *Bourgeau;* Carlton House, *Richardson;* bank of Saskatchewan R., Prince Albert, *J. Macoun,* no. 12,211 (Can.); borders of marshes, Pleasant Plain, *J. Macoun,* no. 15,837 (Can.); borders of marshes near the South Saskatchewan, *J. Macoun,* no. 15,838 (Can.); Souris Plain, *J. Macoun,* no. 15,830 (Can.); damp thickets along Humber Creek, Moose Jaw, *J. Macoun,* no. 12,742 (Can.); Cypress Hills, *J. Macoun,* no. 5313; Farewell Creek, Cypress Hills, *J. Macoun,* no. 11,776 (Can.). Alberta: The Cascade, Athabasca River, *Elizabeth Taylor,* nos. 38, 110; White Mud River, *Spreadborough,* no. 19,852 (Can.); wet spots, Edmonton, *McCalla,* no. 2590 (Can.); grassy banks, Red Deer, *H. H. Gaetz,* no. 7476 (Can.); boggy ground, West Fork, Water Coulée, near Rosedale, *Moodie,* no. 942; bank of Bow River, Calgary, *Malte & Watson,* no. 118,331 (Can.); Elbow River, *J. Macoun,* no. 24,528 (Can.); Rocky Mountains, *Burke;* foot of Devil's Lake, *J. Macoun,* no. 101,401 (Can.). Montana: Willow Creek, *Scribner,* no. 143; moist meadow, Armstead, Beaverhead Co., *Payson & Payson,* no. 1735; mountain canyons, Anaconda, *Blankinship,* no. 727 (Can.). Wyoming: Little Laramie River, *Nelson,* nos. 1871, 1961; damp soil, Hot Spring Bar, 20 mi. south of Jackson, *Merrill & Wilcox,* no. 1039; wet soil, Adams Ranch, Jacksons Hole, *Merrill & Wilcox,* no. 990; low meadow near North Pilot Butte, *Merrill & Wilcox,* no. 749; meadow 20 mi. west of Big Piney, Sublette Co., *Payson & Payson,* no. 2648. Colorado: Rocky Mts., lat. 39° 41′, 1862, *Hall & Harbour,* no. 378; South Park, *E. L. Hughes,* no. 45; Grape Creek, Custer Co., July 2. 1888, *Demetrio;* Gunnison, *Baker,* no. 361.

Jones's original material was from cold bogs at the head of Sevier River, Utah, I have not seen the type but the description clearly

belongs to the characteristic plant of the Rocky Mountain and Great Plain area. The name *P. dealbata* Engelm. (1863), having been published merely as a synonym, cannot displace the validly published, but later *P. incana* Jones (1895). In its smaller extremes *P. incana* closely simulates *P. stricta*, but when well-developed it is quite distinct in its large and copiously farinose leaves, flat and rather broad bracts, and longer and broader strongly farinose calyx.

In its subcapitate inflorescence and plane bracts *P. incana* is nearer related to *P. decipiens* of southern South America (*P. magellanica* of authors) than to other members of the *Farinosae*. This relationship of the Magellanic and Rocky Mountain plants, long familiar in other groups, was clearly recognized by Asa Gray, who, however, failed to detect the characters which separate the two. In enumerating the Rocky Mountain plants of Hall & Harbour, Gray said:

"378. Primula farinosa L., var. foliis sessilibus; umbella capitata; calyce cylindraceo tubum corollae subaequante. *P. dealbata*, Engelm. in litt. But it exactly accords with the left-hand figure of *P. farinosa*, var. *Magellanica* of Hooker's Flora Antarctica (*P. decipiens*, Duby), and with my Antarctic specimens, except that the calyx is perhaps a little longer, and the corolla bluish-purple. . . . It is interesting thus to connect the Antarctic with the northern forms, by specimens from the Rocky Mountains in about lat. 40°."[1]

As stated, Gray overlooked some very real characters: *P. decipiens* (*P. farinosa*, var. *magellanica*) with longer calyx-lobes, the corolla with shorter tube and with much larger white (rarely lilac-tinged) limb (1.2–2 cm. broad) with lobes twice as broad, capsule much longer, and seeds the largest in the section (1 mm. long), rounded-obovoid and conspicuously muricate; but the affinity of *P. incana* is, nevertheless, with *P. decipiens* rather than with *P. farinosa*.

4. P. decipiens Duby. *Leaves* spatulate to narrowly ovate, obovate or rhombic, tapering to a sessile base or broad petiole, *serrulate-dentate*, 1–9 cm. long, 0.7–2 cm. broad, efarinose or farinose beneath: *scape* 0.3–5 dm. high, *stout*, up to 4 mm. in diameter below the umbel, farinose at summit: *involucral bracts flat, lanceolate*, 6–10 mm. long, broadly gibbous at base: *umbel subcapitate*, few- to many-flowered: pedicels stout, pulverulent, lengthening in fruit to 2–10 mm.: *calyx* urceolate-campanulate, *efarinose* or sparingly farinose, in maturity about 1 cm. long and 5 mm. in diameter; the oblong-lanceolate obtuse to acutish *lobes equaling the tube: corolla white* or sometimes tinged with lilac; the greenish *tube shorter than to barely equaling the calyx:*

[1] Gray, Proc. Acad. Nat. Sci. Phila. (1863) 70.

the limb 1.2–2 cm. broad, with obcordate and cuneate-obovate *lobes 3.5–6 mm. broad:* anthers and stigma not exserted from the yellow throat: *capsule* ellipsoid or slenderly ovoid, *distinctly exceeding the calyx: seeds* dark-brown, *1 mm. long, rounded-obovoid, conspicuously muricate.*—Mém. Fam. Prim.—Mém. Soc. Phys. d'Hist. Nat. Genève, x. 46, t. ii. fig. 1 (1844); Duby in DC. Prodr. viii. 44 (1844). *P. magellanica* Hook. Fl. Ant. ii. t. cxx. (1847); Skottsberg, Bot. Surv. Falk. Isl.—Kungl. Sv. Vet. Akad. Handl. l. no. 3: 46 (1913); Skottsb. Vegetationsverhältnisse längs der Cordillera de los Andes. —Bot. Ergebn. Schwed. Exped. Patag. Feuerl. 1907–1909, v. 285 (1916); not Lehm. Mon. Prim. 62, t. vi (1817). *P. farinosa,* var. *magellanica* Hook. Fl. Ant. ii. 337, t. cxx (1847)[1]; Decaisne in Dumont-D'Urville, Voy. au Pole Sud, Bot. ii. 24, t. 31, fig. 5 (1848–53); Franchet, Miss. Scientif. Cap Horn, 1882–1883, v. 354 (1889); Dusén, Svenska Exped. Magellansl. iii. no. 5: 139 (1900); Macloskie, Rep. Princeton Univ. Exped. Patag. 1896–1899, viii[2]. 650 (1905); Pax & Knuth in Engler, Pflanzenr. iv[237]. 85 (1905); De Wildem. Phan. des Terres Magel. 138 (1905); Reiche, Fl. Chil. v. 93 (1910); Vallentin & Cotton, Ill. Fl. Pl. and Ferns Falk. Isl. t. 41 (1921); not *P. magellanica* Lehm. (1817). *P. farinosa* Gay, Fl. Chil. iv. 367 (1849), not L.—Falkland Islands and from Fuegia northward along the Andes of Chili and Argentina to lat. 38° (acc. to Skottsberg).

There is no doubt as to the application of the name *Primula decipiens.* Duby clearly illustrated the plant and his description explicitly gives the diagnostic characters: "foliis . . . serrulatis . . . . , ... invol. . . . calyces subaequantis foliolis elongato-lanceolato-linearibus . . ., calycis . . . . laciniis . . . obtusis, cor. . . . lobis late obcordatis . . . Flores subsessiles etiam in planta fructifera; corollae majores quam in P. farinosa."

Lehmann's *P. magellanica,* to which all subsequent authors except Duby have referred the Falkland and Patagonian plant, differed in many striking characters from the plant with subcapitate white flowers which Duby correctly set off as *P. decipiens.* Lehmann's description called for "Folia . . . dentato-crenata" and his figure of a large plant shows teeth less salient than in large plants of *P. decipiens. P. magellanica* had "Involucri foliola . . . unguicularia," but the bracts of *P. decipiens* are flat and hardly unguiculate. The umbel of *P. magellanica* was described: "Pedicelli . . . unciales . . . Calyx . . . laciniis ovatis, acutis, . . . Corolla . . . carnea: . . . laciniis cuneiformi-

[1] In the text Hooker treats the plant as a variety, but the caption of the plate reads *Primula Magellanica.*

bus"; and the plate accurately coincides with the description, showing flowering pedicels twice as long as the involucre, ovate acute calyx-teeth only half as long as the tube, and narrowly cuneate corolla-lobes only 3–3.5 mm. wide. *P. decipiens*, however, has pedicels nearly obsolete or in fruit only a few millimeters long, the calyx-lobes oblong and obtuse to only subacute and equaling the tube; the white (rarely lilac-tinged) corolla with cuneate-obovate lobes much broader (3.5–6 mm. broad). All authors except Duby have, as said, consistently treated the plant of subantarctic South America as *P. magellanica* or as *P. farinosa*, var. *magellanica* (or sometimes as *P. farinosa*), but either Lehmann's plant did not come from the Straits of Magellan, as he supposed, or else he had a very rare species which has escaped subsequent collectors. It is to be noted that he received the plant indirectly and it is probable that there was some error as to its geographic origin: "Pulchra haecce et nova species Parisiis a Dom. de JUSSIEU absque nomine, sed cum nota: hab. ad fretum Magellanicum, communicata mecum est. In nullo alio herbario eam vidi; neque minus, qui plantam detexerit, cognitum habeo." At any rate, unless *P. decipiens* is far more variable than the six collections before me and the descriptions or plates of such authors as Duby, Hooker, Decaisne, Skottsberg and Vallentin & Cotton indicate, it is wiser not to take up for it the name *P. magellanica* Lehm.

The occurrence of *P. decipiens* in southern South America, separated by about 78 degrees of latitude from its nearest ally in Colorado and Utah, has naturally attracted comment. Thus Hooker, failing to note the characters of the involucre and the very distinct seeds and consequently reducing the plant to varietal rank under *P. farinosa*, said: "One argument which militates against the common origin of the individuals from the opposite hemispheres, must not be overlooked; it is the absence of the plant, and, indeed, of the whole genus, in any part of the Andes [i. e. the Cordillera] south of 39° north lat.; a circumstance which makes it very difficult to account for its appearance in the two opposite temperate zones, if all the individuals of both hemispheres are supposed to have sprung from one parent."[1] Gray's comment in 1863, when he identified the Great Plain and Rocky Mountain plant with the Magellanic, has been quoted in the discussion of *P. incana*. Franchet (1889) and Macloskie (1905)

[1] Hook. Fl. Ant. ii. 337 (1847).

have reiterated the fact, but have added nothing to its interpretation. It is at least noteworthy that the Magellanic plant is closest related, apparently, to *P. incana* of the northern Cordillera and Great Plains (Utah and Colorado north to Mackenzie) and that the smallest extremes of the latter are separated only with difficulty from the circumpolar arctic and subarctic *P. stricta*. In eastern North America, centering on the unglaciated areas about the Gulf of St. Lawrence, dwarf extremes of *P. laurentiana*, superficially so strongly resemble *P. incana* that they have been mistaken for it, and in its efarinose form *P. laurentiana* is separated from the arctic *P. stricta* only with difficulty. Similarly, *P. farinosa* of temperate Eurasia is often difficult to distinguish from *P. stricta* and under their treatment of the latter species Pax & Knuth specially say: "Species haec valde affinis *Pr. farinosae* et forsan melius pro ejus varietate habenda." From this line of evidence it may well be that the arctic *P. stricta* is the progenitor from which have been derived *P. farinosa* and other species of Eurasia, *P. laurentiana* of the Gulf of St. Lawrence region, *P. intercedens* of the upper Great Lakes, *P. incana* of the North American cordillera and still farther isolated, *P. decipiens* of the southern American cordillera.[1]

[1] Similar lines of descent from living arctic species have been suggested in Fernald. *Persistence of Plants in Unglaciated Areas of Boreal America*, Mem. Am. Acad. xv, 334 (1925); and numerous arctic species besides *Primula stricta*, with endemic representatives along the North American cordillera or about the Gulf of St. Lawrence, have their isolated Magellanic or Falkland ally or allies; in such genera as *Puccinellia*, *Draba*, *Saxifraga*, *Empetrum*, *Euphrasia*, *Antennaria*, *Agoseris*, *Taraxacum*, etc.; while others, like *Carex incurva*, *C. Macloviana*, *Plantago juncoides*, etc., show little, if any, differentiation.

(To be continued.)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—NO. LXXIX.

(*Continued from page 78.*)

5. P. SPECUICOLA Rydb. *Leaves* spatulate, rounded at summit, narrowed to a subpetiolar base, *membranaceous, sinuate-dentate,* 4–13 cm. long, 0.7–2 cm. broad, farinose to efarinose beneath: *scape* 1–1.6 dm. high, 1.5–2 mm. in diameter, *efarinose: involucral bracts* lance-attenuate or -involute, 4–10 mm. long, *dorsally thickened but scarcely gibbous at base:* umbel 6–12-flowered: pedicels strongly ascending, in anthesis 0.5–1 cm., in fruit sometimes elongating to 4 cm. long: *calyx farinose,* campanulate, *becoming turbinate,* in maturity 6–9 mm. long and 3 mm. in diameter; the *lance-attenuate to -subulate lobes* about equaling the tube: *corolla-tube* yellowish, *8–10 mm. long,* its *violet limb* 6–10 mm. broad, with the narrowly cuneate lobes emarginate: stamens inserted near the middle of the tube; the anthers and stigma not exserted; *capsule much overtopped by the calyx-lobes:* seeds angulate, 0.4–0.6 mm. long, fulvous, muriculate.—Bull. Torr. Bot. Cl. xl. 461 (1913). *P. farinosa* Eastwood, Proc. Cal. Acad. ser. 2, vi. 304 (1897). —Southeastern UTAH: moist bench of cliffs near Bluff City, *Eastwood,* no. 68; Moab, June 7, 1913, *M. E. Jones.* Rydberg's type was from "loose soil, under overhanging cliffs in the alcove-like heads of the canyons, characteristic of the limestone bluffs of San Juan River," near Bluffs.

P. specuicola differs from *P. farinosa* and from all other American species which have been called *P. farinosa* in the very sharp calyx-lobes, long corolla-tube and short capsule. I have seen no good flowers but Rydberg's description of the corolla-limb as "dark

violet" and Miss Eastwood's characterization of it as "crimson," suggest much deeper coloring than in the other *Farinosae*. Neither of these authors mentions a yellow eye such as occurs in most of the species. The long corolla-tube, deep color of the limb, shape of fruiting calyx, scarcely gibbous bracts, and thin sinuate-dentate leaves suggest that *P. specuicola* may be nearer related to *P. Rusbyi* Greene than to the *Farinosae;* but *P. Rusbyi* has much larger flowers, the leaves with cartilaginous or callous teeth and the caudex bearing marcescent brown sheaths.

6. P. **intercedens**, nom. nov. *Leaves yellow-farinose beneath*, sometimes green, *firm*, obovate, spatulate or oblanceolate, 1–7 cm. long, cuneate at base but scarcely petioled, crenate-dentate or subentire, with the margin commonly revolute: scape 0.4–2.5 dm. high, filiform to stoutish, 0.5–1.8 mm. in diameter and sometimes slightly farinose at summit: *bracts of the involucre* lance-attenuate, involute or subulate at tip, *3–6 mm. long*, slightly dilated and thickened but *scarcely gibbous at base:* umbel 1–10-flowered: the stiffly fastigiate filiform pedicels at first only 1–10 mm. long, in fruit lengthening to 0.6–3 cm.: *calyx* turbinate-campanulate, *commonly farinose*, in anthesis 3.5–4 mm. long, *in fruit 4–6 mm. long*, cleft nearly to the middle into lanceolate to narrowly ovate acute to obtuse lobes: *corolla* lilac; the slender tube slightly exserted: the *limb 1–1.5 cm. broad;* its obovate or cuneate deeply obcordate *lobes 4–7 mm. broad; stigma or tops of anthers slightly exserted* from the yellow throat, at least of shrivelled corollas: *capsule* cylindric, once-and-a-half the length of the calyx, *2–3 mm. in diameter;* its valves splitting into linear halves 0.5–1 mm. wide: *seeds angulate and truncated, strongly rugose* or reticulated, 0.5–0.7 mm. long.—*P. farinosa* Nutt. Gen. i. 119 (1818); Torr. Am. Journ. Sci. iv. 59 (1822); not L. (1753). *P. farinosa, β. americana* Torr. Fl. No. Mid. U.S. i. 213 (1824), excluding syn. *P. pusilla* Goldie; Fernald, Rhodora, ix. 16 (1907); not *P. americana* Rydb. (1901). *P. pusilla* Hook. Bot. Mag. lvii. t. 3020 (1830), not Goldie (1822).—Shores of the upper Great Lakes, southwestern Ontario, northern Michigan and northeastern Minnesota; also Lake Nipigon. Ontario: Johnstone's Harbor, Lake Huron, August 22, 1901, *J. Macoun*, no. 54,260; shore of Lake Superior, July 16, 1867, *J. Macoun* (Can.); dampish places, Lake Nipigon, July 15, 1884, *J. Macoun*, no. 15,846, in part (Can.). Michigan: Isle Royale, August 2, 1865, *A. H. & C. E. Smith* (Penn.); wet rocks, Isle Royale, July, 1889, *Sandberg*, (Minn.); north shore of Thunder Bay, Lake Huron, Alpena Co., July 3, 1895, *C. F. Wheeler;* shore of Thunder Bay near Alpena, July 5, 1895, *C. F. Wheeler;* on and near Lake Huron beach, in damp sand, near Alpena, June 24, 1912, *C. K. Dodge*, no. 3; open pasture near cedars and near shore of Straits of Mackinac, St. Ignace, May 14, 1914, *W. H. Manning;* Keweenaw Peninsula, *Robbins*. Minnesota: Two Harbors, Lake

Co., June, 1891, *Sandberg* (Minn.), June 1891, *E. P. Sheldon*, no. 4400; damp basic eruptic rocks, Susie Island, Cook Co., September, 1927, *Butters* (Minn.); Agate Bay, *L. H. Bailey*, no. 477 (Minn.); Grand Marais, Cook Co., August 4, 1875, *T. S. Roberts* (Minn.), August 17, 1906, *H. L. Lyon*, no. 924 (Minn.).

Nuttall's *P. farinosa* was from "calcareous gravelly shores of the islands of Lake Huron; around Michilimakinak, Bois Blanc, and St. Helena, in the outlet of Lake Michigan: abundant." Torrey's *P. farinosa*, β. *americana*, described in detail by him, came from "shores of Lake Huron, Lake Michigan, &c. *Douglass* and *Nuttall*." It is the plant of upper Michigan and the adjacent region of Ontario and Minnesota which has passed as *P. farinosa*. Unlike true *P. farinosa*, *P. intercedens* has the involucral bracts without basal auricles, the umbels few-flowered (in *P. farinosa* often with 20–25 flowers), the tube of the fruiting calyx only obscurely (in *P. farinosa* strongly) nerved, and the anthers borne higher on the tube, near the throat and slightly protruding from the shrivelled corolla. In the latter character and in the protruding of the style in the long-styled form *P. intercedens* is closer to *P. mistassinica* than to *P. farinosa*, *P. stricta*, *P. laurentiana* and *P. incana;* but it has the strongly angled and conspicuously rugose seeds as in these species, in this important character as well as in the ordinarily heavy development of wax on most of the leaves at once departing from typical *P. mistassinica*.

In perfectly characteristic fruiting material *P. intercedens* seems to stand quite apart, but as yet I have been unable to find floral differences; and, in view of the fact that *P. mistassinica*, with its rounded and less rugose seeds, may be sometimes farinose, the difficulty is increased. *P. intercedens* is here proposed without full confidence of its specific value; but it seems most likely that, in the upper Great Lake region, where it occurs in the same areas as typical *P. mistassinica*, the two have become much crossed. Elsewhere across the continent, from Newfoundland to Yukon and British Columbia, *P. mistassinica* is very constant in its seed-characters. It does not seem probable, then, that *P. intercedens* (*P. farinosa*, β. *americana* Torr.) is to be considered a variation of *P. mistassinica* in which the seeds have taken on (or retained) the characteristics of the coarser *P. stricta*, *P. laurentiana* and *P. incana*. The true status of the plant can be worked out only by the botanists of the upper Great Lake region.

7. P. AJANENSIS E. Busch. *Leaves densely yellow-farinose* beneath, obovate or rhombic-spatulate, 0.6–2 cm. long, 0.5–1.1 cm. broad, narrowed to a *winged or broad and short petiole;* the blade *dentate:* scape slender, 0.3–1 dm. high, farinose at summit: *involucral bracts subulate-lanceolate, 3–5 mm. long,* gradually dilated and thickened but *hardly saccate at base:* umbel 2–12-flowered: *pedicels* filiform, *farinose,* 5–10 mm. long, in fruit sometimes up to 2 or 3 cm. long: calyx campanulate, in maturity 4–6 mm. long and about 3 mm. in diameter, cleft about half its length into lanceolate to oblong lobes: *corolla* violet; the tube only slightly exceeding the calyx; the *limb 1–1.2 cm. broad,* with obcordate lobes about 5 mm. broad: stigma or summits of anthers slightly exserted from the throat: capsule cylindric, about twice the length of the calyx, 2.5 mm. in diameter: seeds not seen.—Fl. Sib. et Orient. Extr. iv. Cem. 65: 34 (1926).—Eastern Siberia and Alaska. ALASKA: dampish moorlands, Nunivak Island, August 8, 1891, *J. M. Macoun,* as *P. stricta* or *P. borealis.*

Primula ajanensis was based on material from Ochotsk Province in eastern Siberia, but Mrs. Busch's clear description and beautiful illustration of it show it to be the plant twice collected by J. M. Macoun on the cruise of the British Bering Sea Commission, once on Nunivak Island (above cited) and later at Plover Bay, Siberia (distributed as *P. borealis*).

8. P. MISTASSINICA Michx. *Leaves efarinose* or rarely a little farinose, oblanceolate, spatulate or cuneate-obovate, sessile or narrowed to short winged petioles, 0.5–7 cm. long, 0.2–1.6 cm. broad, *many of the blades dentate from near or from below the middle: scape* filiform or stouter, 0.3–1.4 mm. in diameter at summit, *efarinose* or but slightly farinose, 0.3–2.1 dm. high: *bracts of the involucre linear-subulate,* 2–6 mm. long, broadened and thickened but *commonly not saccate at base:* umbel 1–10-flowered: *pedicels filiform, 0.2–0.5 mm. in diameter,* much exceeding the bracts, in maturity 0.5–3.5 cm. long: *calyx slenderly campanulate,* 3–6 mm. long, *2–3.5 mm. in diameter, efarinose* or rarely farinose, cleft to the middle into lanceolate, oblong or narrowly ovate obtuse to acute lobes: corolla-tube yellow, exserted; the pale-pink, lilac or bluish-purple (or white in forma LEUCANTHA) limb 0.8–2 cm. broad, its obovate or cuneate-obcordate or emarginate lobes 3–6 mm. broad; eye orange or yellow (except in var. NOVEBORACENSIS): *stigma or tops of anthers protruding* from the throat of the shrivelled corolla: *capsule subcylindric,* once-and-a-half to twice as long as the calyx, *2–3 mm. in diameter;* its valves splitting into linear halves 0.5–0.9 mm. wide: *seeds* 0.4–0.6 mm. long, *rounded,* nearly smooth or obscurely linear-reticulated.

A very variable species, with three strongly marked variations

Limb of corolla 0.8–2 cm. broad, with conspicuous orange or yellow eye.
Corolla-limb pink, lilac or bluish-purple.....Var. *typica*.
Corolla white.....Forma *leucantha*.
Limb of corolla 0.8–1 cm. broad, without conspicuous yellow eye.
Var. *noveboracensis*.

Var. **typica**. *P. mistassinica* Michx. Fl. Bor.-Am. i. 124 (1803); Lehm. Monogr. Prim. 63, t. 7 (1817); Hook. Bot. Mag. lvii. t. 2973 (1830); Duby in DC. Prodr. viii. 43 (1844); Gray, Syn. Fl. N. A. ii. pt. 1: 58 (1878) in part. *P. pusilla* Goldie, Edinb. Phil. Journ. vi. 322, t. 11, fig. 2 (1822). *P. Hornemanniana* Hook. Fl. Bor.-Am. ii. 120 (1838), in part, not Lehm. (1817). *P. farinosa*, var. *mistassinica* (Michx.) Pax, Engler's Bot. Jahrb. x. 200 (1889) in part. *P. farinosa*, subsp. *mistassinica* (Michx.) Pax & Knuth in Engler, Pflanzenr. iv[237]. 85 (1905), in large part. *P. sibirica*, var. *mistassinica* (Michx.) Kurtz, Engler's Bot. Jahrb. xix. 396 (1894). *P. Maccalliana* Wiegand, Bull. Torr. Bot. Cl. xxvii. 389 (1900); Brown & Schaefer, Alp. Fl. Can. Rocky Mts. 227, t. lxiii. (1907); Rydb. Fl. Rocky Mts. 647 (1917).—Southern Labrador and Newfoundland to southern Yukon, south to central Maine, northern Vermont, northern Michigan, northern Wisconsin, northern Minnesota, southern Alberta and southern British Columbia. The following, selected from about 150 numbers, are representative. LABRADOR: grassy banks, Lake Michikamau, Hamilton River, *A. P. Low*, no. 6035 (Can.). NEWFOUNDLAND: bare wet peat and depressions in limy bog-barrens, Rock Marsh, Flower Cove, *Fernald, Long & Dunbar*, no. 26,958; peaty and turfy pockets in limestone barrens, Brig Bay, *Fernald, Long & Dunbar*, no. 26,959; borders of ponds on the limestone tableland, Table Mt., Port-à-Port Bay, *Fernald & St. John*, no. 10,860; by Grand Codroy River, July 10, 1912, *J. R. Lunt*. QUEBEC: Eskimo Point, June, 1909, *C. W. Townsend, St. John*, no. 90,676 (Can.); Anticosti, June 20, 1861, *Hyatt, Shaler & Verrill;* sur les talus calcaires, Rivière Vaureal, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 21,831; rivage du Lac Salé, Anticosti, *Victorin & Rolland*, no. 25,107; by springs, calcareous summit and northerly slopes of Percé Mt., Percé, *Fernald & Collins*, no. 1145; endroits sourceux, au pied de Montagne Sainte-Anne, Percé, *Victorin, Rolland, Brunel & Rousseau*, no. 17,645; calcareous cliffs, facing north, alt. 900–1125 m., Table-top Mts., *Fernald & Collins*, nos. 707, 708; calcareous slaty cliffs, alt. 300 m., Lac Pleureuse, *Fernald, Dodge & Smith*, no. 25,983; moist rocks and turfy chimneys, alt. 800–1050 m., Pease Basin, between Mts. Logan and Pembroke, *Pease & Smith*, no. 25,982; wet red-sandstone bluffs along Bonaventure River, August, 1904, *Collins, Fernald & Pease* (with stolon nearly 1 dm. long!); wet ledges by Escuminac Brook, Grand Cascapedia River, July 12–15, 1905, *Williams, Collins & Fernald;* Rivière des Goelands, *Michaux*, TYPE in herb. Mus. d'Hist. Nat. Paris ("ad lacus *Mistassins* Canadam inter et fretum *Hudsonis*"—Michx. Fl. Bor.-Am. i. 124);[1] about

[1] Michaux's label reads definitely "Rivière des Goelands," not Lake Mistassini and his *Journal* does not enumerate it from Lake Mistassini. Rivière des Goelands was

Quebec, May 21, 1863, ex herb. *Univ. Laval;* rochers humides, Ile d'Orleans, *Victorin*, no. 16,122. New Brunswick: moist ground, Connor, Madawaska, *Pease*, no. 2248; Grand Falls, *Malte & Watson*, no. 118,333 (Can.); crevices of calcareous rock, Gorge of Aroostook River, July 17, 1902, *Williams, Collins & Fernald;* wet rocks, Woodstock, *J. Macoun*, no. 22,545 (Can.); Kennebecasis River, July, 1880, *Hay;* rocky shore of St. John River, near mouth, 1884, *Hay.* Nova Scotia: wet boggy banks, Truro, *J. Macoun*, no. 15,841 (Can.); Upper Stewiacke, *Miss A. L. Archibald*, no. 69,371 (Can.). Maine: gravelly shores, St. Francis, *Fernald*, no. 2427; seepy gravelly shores, Fort Kent, *Fernald*, no. 2428; ledgy banks of Aroostook River, Masardis, September 8, 1897, *Fernald;* sandy river bank, Fort Fairfield, *Fernald*, no. 82; Houlton, 1881, *Kate Furbish;* limestone rocks, banks of Piscataquis River, Sangerville, *Chamberlain*, no. 298; banks of Piscataquis River, Foxcroft, May 12, 1894, *Mary L. Fernald;* crevices of ledges along river, Dover, May 12, 1895, May 21, 1896, *G. B. Fernald;* springy limy gravel beach, Township ix, Range 17, Somerset Co., *St. John & Nichols*, no. 2444. Vermont: wet calcareous cliffs, Willoughby Mountain, *Pringle et al;* rocky ledges, Mt. Annance, Willoughby Lake, September 20, 1855, *Wm. Boott;* roadside, Willoughby, June 12, 1896, May 21, 1905, *Kennedy;* 4th of July Slide, Willoughby, June 12, 1905, *Kennedy;* bog near Willoughby Lake, June 1, 1909, *Churchill.* Ontario: Lake Nipigon, *J. Macoun*, no. 15,846 in part (Can.); Pic River, Lake Superior, *Loring;* ledges by Lake Superior, Agawa Bay, *Pease*, no. 17,971; calcareous rock, Current River Falls, Port Arthur, *Williamson*, no. 2888 (Penn.); mouth of Albany River, James Bay, *Spreadborough*, no. 62,556 (Can.). Michigan: Marquette Island, Les Chanaux Islands, August 27, 1913, *W. H. Manning;* Isle Royale, August 2, 1865, *A. H. & C. E. Smith* (Penn.), *Cooper*, no. 55; Presque Isle, *Houghton;* rocky shore, Delta

the name used by Michaux for a large river emptying from Lake Mistassini into Hudson Bay. "Le 4 Septemb. [1792] . . . A 10^h ¼ entré dans le Lac Mistassin. . . . Le 5 fait environ 8 à 10 lieues et diné sur la rive des Goelands à 16 lieues de distance du Lac. . . . Le soir campé . . . 22 lieues en totalité. Campé pres la rivièrre Atchouke. (Riv. des Loup-marins)"—Journ. André Michaux, ed. Sargent. 81, 82 (1889). L'Abbé Ovide Brunet gave this account: "Having made his collections, and reached the other side of the lake, Michaux proceeded on his journey; choosing for this purpose, among the discharges of the lake, a large and fine river falling into Hudson's Bay, and known as the Rivière des Goëlands (Gull River), which is very probably that designated in the maps as Rupert's River. He followed this for some distance, and camped on the night of September 5th, near the Atchoukue or Seal River. . . . Along the banks of the Gull River the following plants were collected: —*Xylosteum villosum*, Michx.; *Primula Mistassinica*, Michx." etc.—Brunet, *Michaux and his Journey in Canada*, Can. Nat. ser. 2, i. 336, 337 (1864).

From this evidence it might be inferred that *Primula mistassinica* was not seen by Michaux on the shores of Lake Mistassini; but in the report of his collections from Lake Mistassini, Rupert River and Rupert House, Geol. and Nat. Hist. Surv. Can. n.s. i. 36–44D (1886) the late J. M. Macoun recorded it only from the Lake not from Rupert River, and he subsequently recorded it as "One of the commonest plants at Lake Mistassini"—Macoun, Cat. Can. Pl. i. 564 (1886). The organized portion of the National Herbarium at Ottawa shows, however, no material from Lake Mistassini.

County, August 17, 1901, *M. A. Barber.* WISCONSIN: sand beach near Rowley's Bay, Door County, *Pease*, no. 18,003; moist ledges by St. Croix River, St. Croix Co., *Rosendahl*, no. 4238 (Minn.). MINNESOTA: Encampment, Lake Co., *Sheldon*, no. 4768 (Minn.); moist rocks, Grand Marais, *Rosendahl & Butters*, no. 4643 (Minn.); Two Harbors, *Sandberg* (Minn.); Knife River, *Sheldon*, no. 4948 (Minn.). MANITOBA: Mile 256, Hudson Bay Ry., July 12, 1917, *J. H. Emerton;* Clearwater Lake, July 2, 1917, *J. H. Emerton;* Sewell, *J. Macoun*, no. 12,726 (Can.). SASKATCHEWAN: without locality, 1857–8, *Bourgeau;* north side of Lake Athabasca, *J. W. Tyrrell*, no. 15,840 (Can.). MACKENZIE: Mackenzie River, *Richardson;* west shore of Great Bear Lake, *J. M. Bell*, no. 22,956 (Can.); southwest and north shore of Great Slave Lake, *C. F. Howe*, no. 1019 (Can.). ALBERTA: Red Deer River, *J. Macoun*, no. 15,842 (Can.); Rocky Mountains, *Drummond, Burke;* Junction of North Fork and North Branch of Saskatchewan, *S. Brown*, no. 919; Bear Creek Camp No. 1, *S. Brown* no. 900; Pipestone Creek, *J. Macoun*, no. 68,725; vicinity of Basin, Banff, *S. Brown*, no. 13; moist ground, Banff, alt. 4900 ft., *Butters & Rosendahl*, no. 1327, June 4, 1904, *E. M. Farr* (Penn.); Devil's Head Lake, *Sanson*, no. 22,140 (Can.); Laggan, *J. Macoun*, no. 68,723 (Can.). BRITISH COLUMBIA: near Field, June, 1896, *C. E. Cummings;* river flats, Yoho Valley, alt. 5000 ft., *Butters & Rosendahl*, no. 1434; Torrent Fan, Emerald Lake, *Heacock*, no. 14; Six-Mile Creek, May 18, 1905, *Edith M. Farr* (Penn.). YUKON: Frances River, lat. 61°, *Dawson*, no. 15,844 (Can.).

Forma LEUCANTHA Fernald, RHODORA, xxi. 148 (1919).—With the typical form, often more abundant. NEWFOUNDLAND: Glenwood, *Fernald & Wiegand*, no. 6072; Grand Falls, *Fernald, Wiegand, Bartram & Darlington*, no. 6070; Millerton Junction, *Fernald & Wiegand*, no. 6071; Grand Lake, 1906, *Owen Bryant;* Savage Cove, *Fernald, Wiegand, Pease, Long, Gilbert & Hotchkiss*, no. 28,891; Flower Cove, *Pease, Long & Gilbert*, no. 28,890; Middle Arm, Bay of Islands, *Waghorne*, no. 5; near Frenchman's Cove, Bay of Islands, *Mackenzie & Griscom*, no. 10,405; Birchy Cove (Curling), *Fernald & Wiegand*, no. no. 3881; Table Mountain, Port-à-Port Bay, *Fernald & St. John*, no. 10,861. QUEBEC: Eskimo Point, Saguenay Co., June, 1909, *C. W. Townsend;* Percé, *J. M. Macoun*, no. 68,948. VERMONT: Willoughby, May 24, 1904, *Kennedy.*

Var. **noveboracensis**, var. nov., foliis obovatis vel late oblanceolatis; corollae limbo 0.8–1 cm. lato, fauce vix flava.—*P. mistassinica* Torr. Fl. N. Y. ii. 7 (1843); Paine, N. Y. State Cat. 18th Ann. Rep. 105 (1865); Clinton, N. Y. State Mus. 24th Rep. 101 (1872); Prentiss, Bull. Torr. Bot. Cl. iv. 15 (1873); Dudley, Cayuga Fl. 60 (1886); Rowlee, Bull. Torr. Bot. Cl. xx. 69 (1893); Peck, N. Y. State Mus. 46th Rep. 48 (1893); House, Wild Fl. N. Y. ii. 211, t. 159B (1918); House, Annot. List Ferns and Fl. Pl. N. Y. 588 (1924); Wiegand & Eames, Fl. Cayuga L. Basin, 338 (1926); not Michx.—Cold or wet

cliffs and ravines northwestern and central New York, southern Ontario, southern Michigan and northern Illinois. New York: "Penn Yan," *Sartwell* (acc. to House "the specimen in the Sartwell herbarium is labelled 'Hammondsport'"); Annsville, Taberg, June, 1846, *Knieskern & Vasey;* Taberg, *Paine;* wet rocks, Taberg, May 23, 1920, *House*, no. 6911 (Can.); cliffs of Fish Creek, Oneida Co., 1864, *Paine;* Crooked Lake, *Sartwell;* dripping cliff, south side of ravine near Triphammer Falls, Fall Creek, Ithaca, May 27, 1915, *A. J. Eames*, no. 4804 (type in Gray Herb.); wet limy cliffs, Taughannock Ravine and vicinity, Ulysses, *MacDaniels*, no. 3020; other stations cited in Portage and on Salmon River, Oswego Co. Ontario: Galt, May 31, 1907, *J .Macoun*, no. 88,032 (Can.). Michigan: Clifton. June, 1883, *F. E. Wood;* rocks, Grand Ledge, 10 miles west of State College, May 3, 1890, *C. F. Wheeler;* face of wet rocks in moss, bank of Grand River, 10 miles west of State College, May 10, 1890, *C. F. Wheeler.* Illinois: limestone cliffs, Jo Davies County, June 15, 1891, *H. S. Pepoon* (Minn.).

Var. *noveboracensis* has smaller flowers than most of the more northern and typical *P. mistassinica*, but occasional northern plants have them as small. In its lack of a well marked orange eye it is most striking, true *P. mistassinica* having the throat bordered by a brilliant yellow or orange ring (as in most of the § *Farinosae*). The leaves of var. *noveboracensis* are somewhat distinctive but similar foliage occasionally occurs in the more northern type with larger corolla and yellow eye.

I have sought in vain for any character upon which to separate *P. Maccalliana* from *P. mistassinica*, but can find absolutely nothing to separate it from the variable plant of eastern Canada, northern New England and Newfoundland. In describing it, Wiegand said: "From the eastern *P. Mistassinica* it differs quite markedly in its stouter habit, broader and more farinose leaves, short-pedicelled flowers, larger acute-lobed calyx, and large bluish, not pink or flesh-colored, corolla with tube scarcely longer than the calyx, and with a very prominent yellow eye." In interpreting the description of *P. Maccalliana* it should be borne in mind that Wiegand knew as *P. mistassinica* the var. *noveboracensis*, which is a very small extreme without "prominent yellow eye." As for the other characters, an abundant series of specimens shows that *P. mistassinica* may have in the same general region either obtuse or acute or even attenuate calyx-lobes, the leaves efarinose or slightly farinose, dentate or entire, and the pedicels and corolla-tube very variable in length. The blue color emphasized by Wiegand is not a constant character.

Professor Butters, who has collected the plant at Banff and elsewhere in the Canadian Rockies, assures me that the fresh flowers are pink or lilac-purple and that he has never seen any decided blue in them except as a post-mortem character in dried specimens. The late Stewardson Brown, who also knew *P. Maccalliana* in the field, says, "Flowers . . . pale pink or bluish" and Mrs. Schäffer's photograph of it looks quite like eastern *P. mistassinica*. In this connection it is not inappropriate to quote the description by the late John A. Paine of the station of *P. mistassinica*, var. *noveboracensis* on Fish Creek, Oneida Co., New York:—

"Near dripping water the plants grow most abundantly and largest, often eight or ten inches in height, and bearing a cluster of as many flowers. These vary in color, from pure white, through different shades of pink, to deep blue. The leaves also vary in form, from round obovate to oblong lanceolate; often entire, commonly more or less toothed; usually smooth beneath, but frequently white mealy. A whole cliff-side scattered over with these variegated Primroses is one of the loveliest sights in all our flora."[1]

If *P. Maccalliana*, originally separated from the plant of New York by "bluish, not pink or flesh-colored, corolla" may have, as described by those who know it in the field, "Flowers . . . pale pink" and if the New York plant may have them "from pure white, through different shades of pink, to deep blue," it is obvious that color of the corolla in these cases is no safer as a specific criterion than it is in most other plants! *P. Maccalliana* more often has the leaves entire or subentire and slightly farinose, but plenty of western specimens have the nonfarinose leaves copiously dentate. Conversely, many eastern plants have some or all of the leaves subentire to entire and occasionally eastern plants show them more strongly farinose than any from the Rocky Mountains.

9. P. PARVIFOLIA Duby. *Leaves efarinose, cuneate-obovate, spatulate or rhombic*, 0.4–3 cm. long, 1.5–7 mm. broad, the lower scarcely petioled, *the upper with winged petioles*, the margin denticulate: scape filiform, 0.4–1.8 dm. high, efarinose: *bracts of involucre* lance- or linear-*subulate, 2–5 mm. long, dilated and thickened but not saccate at base:* umbel 2–9-flowered: pedicels filiform, 6–15 mm. long: *calyx* campanulate, *efarinose*, somewhat gibbous at base, 3–5 mm. long, cleft half-way into lanceolate lobes: *corolla* lilac; the tube rarely exserted; the *limb 7–10 mm. broad*, with the emarginate or obcordate cuneate *lobes 1.5–3 mm. broad:* stigma or summits of anthers exserted: capsule

[1] Paine, N. Y. State Cat. 18th Ann. Rep. 105—Reprint, 53 (1865).

cylindrical, up to once-and-a-half the length of the calyx, 2 mm. in diameter: seeds rounded-obovoid, smooth, about 0.5 mm. long.—Duby in DC. Prodr. viii. 42 (1844). *P. mistassinica* Cham. & Schlechtd. Linnaea, i. 213 (1826), in large part; Eastwood, Bot. Gaz. xxxiii. 212 (1902); not Michx. (1803). *P. tenuis* Small, Bull. Torr. Bot. Cl. xxv. 320 (1898). *P. borealis*, var. *parvifolia* (Duby) Pax in Engler & Prantl, Pflanzenr. iv[237]. 81 (1905). *P. Chamissonis* E. Busch, Fl. Sib. et Orient. Extr. iv. Cem. 65: 28 (1926).—Alaska and adjacent Siberia. Alaska: several stations cited by Chamisso & Schlechtendal and by Mrs. Busch; Cape Nome, 1900, *Blaisdell*, no. 129, as *P. mistassinica*.

Duby's *P. parvifolia*, described "ad fretum Beering (Fisch.! in herb. cl. Kunth)", is treated by Pax as a small-leaved variety of *P. borealis* Duby; while Mrs. Busch, in her remarkably exhaustive treatment of the Siberian *Primulaceae*, makes no mention of it, even as a synonym. In view of the reduction by Pax of the wholly distinct *P. Loczii* Kanitz of central Asia to *P. borealis* (see discussion under the latter) it need not be surprising that Pax should also include in *P. borealis* the very distinct *P. parvifolia*. Surely, Duby, who published both *P. parvifolia* and *P. borealis*, was too discerning a specialist to separate them if they differ only by a millimeter or two in the length of the leaves and by the slightly different outline of the latter. Duby indicated other differences, notably: in *P. parvifolia* "corollae lobis emarginatis," in *P. borealis* "corollae . . . lobis obcordatis semi-bifidis." The plant of the Bering Straits region and Alaska, described in detail and beautifully illustrated by Mrs. Busch as *P. Chamissonis*, well matches the description of Duby as does the Blaisdell material from Cape Nome. Should it eventually prove that I am in error in identifying these with *P. parvifolia*, the name *P. tenuis* Small (1898) should be used for the plant here described.

10. P. borealis Duby. *Leaves efarinose* or only sparingly farinose, *cuneate-obovate or rhombic-spatulate*, 0.6–4 cm. long, 1.5–10 mm. broad, mostly with *petioles longer than the dentate blade:* scape filiform, efarinose, 2.5–10 cm. high: *bracts of involucre* lance-subulate, often unguiculate, 2–6 mm. long, dilated and *usually slightly saccate-gibbous at base:* umbel 1–12-flowered: pedicels filiform, 0.2–1.4 cm. long: *calyx turbinate-campanulate*, efarinose or barely farinose, somewhat *gibbous at base*, in maturity 5–6 mm. long, cleft one-half its length into lance-ovate acute to obtuse segments: *corolla* lilac; the tube equaling the calyx or slightly exserted; the *limb 1.2–2 cm. broad, its deeply obcordate lobes 5–8 mm. broad:* stigma or tops of anthers protruding from the throat of the wilted corolla: capsule cylindric, only

slightly exserted: seeds less than 0.5 mm. long, smoothish.—Mém. Fam. Prim.,—Mém. Soc. Phys. d'Hist. Nat. Genève, x. t. ii. fig. 2 (1844) and in DC. Prodr. viii. 43 (1844); Ledeb. Fl. Ross. iii. 15 (1847–49); Pax & Knuth in Engler, Pflanzenr. iv[237]. 81 (1905), excl. var. *parvifolia;* Ostenfeld, Vidensk, Selsk. Skrift, i. Math.-Naturv. Kl. no. 8: 60 (1910); J. M. Macoun & Holm. Rep. Can. Arct. Exped. 1913–18, v. pt. A, 18A, t. xi. fig. 4 (1921); E. Busch, Fl. Sib. et Orient. Extr. iv. Cem. 65: 31 (1926). *P. mistassinica* Cham. & Schlecht. Linnaea, i. 213–215 (1826), in part; and other authors on the flora of Bering Sea region; not Michx. (1803). *P. sibirica,* var. *borealis* (Duby) Kurtz, Engl. Bot. Jahrb. xix. 397, 468 (1894). *P. borealis,* var. *Loczii* Pax in Engler & Prantl, Pflanzenr. iv[237]. 81 (1905), not *P. Loczyi* Kanitz (1891).—Arctic Mackenzie and Yukon, arctic and western Alaska and adjacent Siberia. The following American specimens have been examined: MACKENZIE: Warren Point, *Stringer,* no. 62,251 (Can.); Cape Bathurst, *Frits Johansen,* no. 533; Pillage Point, Arctic coast, July 19, 1924, *W. H. B. Hoare* (Can.); mouth of Moose River, Mackenzie Delta, July 18, 1924, *Hoare* (Can.). YUKON: Herschell Island, *Stringer,* no. 14,423 (Can.), *Frits Johansen,* no. 265 (Can.). ALASKA: Collinson Point, Camden Bay, *Frits Johansen,* nos. 50, 119, 119a (Can.); west of Konganovik, Camden Bay, *Frits Johansen,* no. 56; Point Hope, 1884, *Cruise of the Corwin;* Kotzebue Sound, *Fischer, Mertens;* Schismaroff Inlet, *Chamisso,* as *P. mistassinica;* Koyuk River, collector unknown; St. Michaels, Norton Sound, *Bannister* on Western Union Extens. Telegr. Expl. Exped. 1865–66, as *P. stricta;* St. Michaels, 1881, *J. Muir.* Simmons, Phytogeogr. Arct. Am. Archipel. 119 (1913) cites specimens from BANKS LAND.

Primula borealis is a variable species, but not so variable as one would infer from various published accounts of it. From its immediate allies it is distinguished, when in good condition, by the unusually large corolla with very deeply obcordate and broad lobes. From the first it has been often misinterpreted as small-flowered. Duby described it as growing "in Americae occidentali-borealis sinubus Schischmar[e]ff et Sancti Laurentii (Cham.! Bunge!)" and his illustration showed corollas barely 1 cm. broad but with the very characteristic deep notching of the lobes. The material of Chamisso's plant from "Sinus Schischmareff" in the Gray Herbarium has the flowers badly shrunken and shriveled so that they give no adequate impression of the size of the fully expanded corolla. Mertens's material, originally labeled as coming from "Sinus St. Laurentii," but changed in pen to "Sinus Kotzebue," also has badly shriveled flowers as does further material from Kotzebue Sound collected by Fischer. I have not seen the Bunge material from "Sancti Laurentii" (whether from

St. Lawrence Island, Alaska, or from St. Lawrence Bay, Siberia is not clear); but it is evident that these old collections which were available to Duby and his immediate successors failed to display the large corolla which is seen on some of the more modern specimens. Consequently we find Gray, in the *Synoptical Flora of North America*, describing *P. borealis* with "lobes of the purple corolla oblong, barely 2 lines long, deeply notched" and reducing to it *P. egaliksensis*, which has the smallest flowers of any American species, instead of the largest flowers. The specimens in the Gray Herbarium studied by Gray show that he had only poorly prepared material of *P. borealis* and that he confused with it both the typical white-flowered *P. egaliksensis* and its violet-flowered form. Similarly, Mrs. Busch, working with the collections at Leningrad, describes the corolla "lobis 3–5 mm. lg., loco latissimo 3–5 mm. lt."; but Pax & Knuth, more accurately say "limbus 12–14 mm diametiens." The fully expanded flowers of well-prepared specimens before me are 1.2–2 cm. broad and I have seen no well-pressed flowers with corolla-lobes less than 5 mm. broad at summit, while in the largest specimens they are 8 mm. broad.

The largest extreme of *P. borealis*, with leaves from 1–4 cm. long, has been identified by Pax with *P. Loczyi* Kanitz; and making up his *P. borealis*, var. *Loczii* of a collection from Bering Strait and the plant described by Kanitz, he gets the extraordinary range, "Alaska: St. Lorenz . . . Kansu: am Chaji-san . . . " Kansu, in high central Asia would hardly be expected to share a species or variety in so technical a group as *Primula* with the shores of Bering Strait, fully 5500 km. to the northeast; and a glance at the description and the detailed illustration of *P. Loczyi*[1] at once shows that they are not closely related. To be sure, Kanitz spoke of his species as "Ex affinitate *P. borealis* Duby." *P. borealis*, however, has the leaves long-petioled, with the 1–7 pairs of teeth confined to the upper half of the rhombic blade, *P. Loczyi* has the cuneate-obovate leaves scarcely petioled and dentate nearly to base; the involucral bracts of *P. borealis* are lance-subulate and gibbous at base; in *P. Loczyi* linear, flat and tapering at base (consequently not of § *Farinosae*); the calyx of *P. borealis* is gibbous at base and cleft to the middle, the

[1] Kanitz Ágost, A Növénytani Gyüjtések Eredményei Gróf Széchenyi Béla Keletázsiai Utjából (1877–1880),—Plantarum in Expeditione Speculatoria Comitis Béla Széchenyi a Ludovico de Lóczy in Asia Centrali Collectarum Enumeratio, 36, t. III. i (1891); Scechenyi Ostasiat. Reise (Bot.) ii. 713, t. 3, figs. 1–2 (1898).

calyx of *P. Loczyi* non-gibbous and cleft about one-third its length; the anthers of the short-styled form of *P. borealis* are inserted at and slightly protrude from the throat; in *P. Loczyi* they are borne about midway on the corolla-tube. That *P. Loczyi* is neither a variety of *P. borealis* nor closely related to that species should be apparent.

11. P. EGALIKSENSIS Wormskj. *Leaves thin, efarinose, ovate, oblong, obovate or spatulate, entire* or obscurely undulate (very rarely obscurely dentate), *slender-petioled,* 0.5–5 cm. long, 0.2–1.5 cm. wide, the petiole often equaling to exceeding the blade: *scapes strict, efarinose,* pale-green, 0.1–2.4 dm. high, 0.5–2.3 mm. in diameter at summit: *involucral bracts* green, *lanceolate or lance-oblong to lance-subulate,* flat to involute, *dilated and gibbous-saccate at base,* 2.5–7 mm. long: umbel 1–9-flowered: pedicels strict, in anthesis from about equaling to thrice the length of the bracts; in fruit becoming very unequal, the longest 0.5–5 cm. long (in exceptional individuals bearing secondary umbels): *calyx* pale-green, cylindric to slenderly campanulate, often gibbous at base, 3.5–6 mm. long, *cleft one-fourth to one-third its length* into oblong to deltoid round-tipped to acutish *glandular-ciliate lobes:* the yellowish corolla-tube slightly exserted; the *white limb 5–9 mm. broad; the cuneate lobes distinctly shorter than the tube, 1.6–4 mm. broad, cleft one-third to one-half their length:* anthers borne well below the yellow throat: style shorter than or but slightly overtopping the anthers: mature *capsule* stramineous, *slender-cylindric,* tapering at summit, *becoming two to three times as long as the calyx, 7–13 mm. long, 1.8–2.1 mm. in diameter: seeds pale-brown to stramineous, smooth,* 0.5–0.6 mm. long.—Wormskj. in Hornem. Fl. Dan. ix. fasc. xxvi. 2, t. mdxi. (1816); Lange, Consp. Fl. Groenl. 71 (1880), 260 (1887); Fernald, RHODORA, xxviii. 54, 60, 75, 118, 224 (1926). *P. egalliccensis* Lehm. Monogr. Prim. 64, t. vii. (1817); Pax, Engler's Bot. Jahrb. x. 198 (1889); Pax & Knuth in Engler & Prantl, Pflanzenr. iv[237]. 77 (1905). *P. sibirica* Hook. Fl. Bor.-Am. ii. 121 (1838), in part; J. M. Macoun & Holm, Rep. Can. Arct. Exped. v. Pt. A. 18A, t. xi. fig. 5 (1921); not Jacq. (1778). *P. sibirica, γ minor* Duby in DC. Prodr. viii. 43 (1844), as to Greenland plant. *P. borealis* Gray, Syn. Fl. N. A. ii. pt. 1: 58 (1878), in part, not Duby (1844).—Southern Greenland and Labrador to Alaska, south to northern Newfoundland, eastern Quebec, shores of James Bay, Alberta and British Columbia.—GREENLAND: Igaliko (type-locality), July 27, 1888, *Rosenvinge,* August 6, 1925, *A. E. & M. P. Porsild.* LABRADOR: Battle Harbor, *Bowdoin College Exped.* 1891, no. 103; *Waghorne,* no. 15,849 (Can.); damp mossy rocks, Battle Harbor, August, 1911, *C. S. Williamson* (Penn.). NEWFOUNDLAND: mossy brooksides and damp turfy slopes, Sacred Island, *Fernald & Long,* no. 28,899; mossy and turfy trap cliffs and talus, Anse aux Sauvages, *Fernald, Wiegand & Long,* no. 28,900; boggy tundra, Schooner (or Brandy) Island, *Pease & Long,* no. 28,903; moist turfy or peaty depressions in limestone barren, Cook Point, *Fernald*

& Gilbert, no. 28,894; springy swales and turfy shores, Boat Harbor, *Fernald, Wiegand & Long*, no. 28,895; swale near mouth of brook, Watts Bight, *Pease, Griscom, Gilbert & Hotchkiss*, no. 28,897; gravelly barren east of Big Brook, *Pease, Griscom, Gilbert & Hotchkiss*, no. 28,896; wet limestone barrens on the Highlands northeast of Big Brook, *Fernald, Wiegand & Hotchkiss*, no. 28,902; peaty and turfy limestone barrens west of Big Brook, *Long & Gilbert*, no. 28,893; bog, Flower Cove, July 12, 1920, *M. E. Priest*, September 2, 1923, *A. G. Huntsman;* swales and wet peaty limestone barrens, Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,960; springy swale south of the Hospital, Flower Cove, *Fernald, Long & Dunbar*, no. 26,961; limy swale bordering the Rock Marsh, Flower Cove, *Fernald Griscom & Gilbert*, no. 28,892; springy peat on limestone gravel near the sea, St. Barbe, *Fernald, Long & Dunbar*, no. 26,962; borders of pools and rills in limestone barrens, St. John Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,898. Quebec: Ungava Bay, 1884, *L. M. Turner;* along Noyava River, near Fort Chimo, *Spreadborough*, no. 14,420 (Can.); gravelly patch at head of rocky shore, Middle St. Mary Island, July 22 and 23, 1927, *H. F. Lewis* (Can.); mossy bank, island off Pointe au Maurier, Charnay, *St. John*, no. 90,677 (Can.); sur les plages calcaires, Pointe-aux-Ammonites, Mingan, *Victorin & Rolland*, no. 18,418; sur les plages calcaires, Ile à la Vache Marine, Mingan, *Victorin & Rolland*, no. 18,419; sur les corniches calcaires, Ile Tète à la Baleine, Mingan, *Victorin & Rolland*, no. 21,830; sur le calcaire sourceux, Ile Saint-Charles, Mingan, *Victorin & Rolland*, no. 25,109; Richmond Gulf, *Spreadborough*, no. 34,449 (Can.), as *P. stricta;* north of Cape Jones, Hudson Bay, *Low*, no. 63,243 (Can.), as *P. stricta* altered to *P. sibirica;* damp banks, Charlton Island, James Bay, *J. M. Macoun*, no. 15,847, as *P. mistassinica*. Ontario: mouth of Ekwan River, James Bay, *Dowling*, no. 34,525 (Can.), as *P. stricta*, changed to *P. sibirica*. Manitoba: Churchill, *J. M. Macoun*, no. 79,390, as *P. sibirica*. Mackenzie: Bernard Harbor, *Frits Johansen*, no. 369 (Can.), as *P. sibirica;* west shore of Great Bear Lake, *J. M. Bell*, no. 22,955 (Can.), as *P. sibirica*. Yukon: moist river-banks, near mouth of Lewes River, *Gorman*, no. 1052 in part (Can.), mixed with *P. stricta*. Alaska: wet meadows, Yakutat, *E. P. Walker*, no. 1052; Chignik Bay, Alaska Peninsula, June 19, 1874, *Baker*.

Forma **violacea**, nom. nov. Whole plant darker: scapes and pedicels suffused with violet or purple-black: bracts and calices purple-tinged or spotted, often blackish: corolla violet or deep-lilac. —*P. sibirica* Hook. Fl. Bor.-Am. ii. 121 (1838), in part, not Jacq. (1778). *P. borealis* Gray, Syn. Fl. N. A. ii. pt. 1: 58 (1878), in part, not Duby (1844). *P. stricta*, var. *groenlandica* Warming, Svensk. Vet. Akad. Handl. xii. Afd. iii. no. 2: 21, fig. 7, A-D (1887); Lange, Conspect. Fl. Groenl. 260 (1887). *P. farinosa*, var. *groenlandica* (Warming) Pax, in Engler, Pflanzenr. iv[237]. 84 (1905), in small part

only, but as to name-bringing synonym. *P. sibirica*, var. *arctica* Fernald, Rhodora, xxviii. 98, 99, 105, 224 (1926), not Pax (1905). *P. farinosa*, subsp. *P. groenlandica* (Warming) W. W. Smith & Forrest, Notes Roy. Bot. Gard. Edinb. xv. no. lxxvi. 24 (1928). *P. groenlandica* (Warm.) W. W. Smith & Forrest, l. c. 49 (1928).—Throughout the range of the species, and sometimes more abundant. Greenland: Itivnek, Holsteinsborg Distr., July 13, 1884, *Warming & Holm*, (duplicate type of *P. stricta*, var. *groenlandica*); mixed with typical *P. egaliksensis*, Igaliko, August 6, 1925, *A. E. & M. P. Porsild*. Newfoundland: wet hollows in limestone gravel-barrens, Cook Point, *Fernald & Gilbert*, no. 28,917, *Fernald, Gilbert & Hotchkiss*, no. 28,919; wet bank on limestone barrens, Cape Norman, *Wiegand, Griscom, Gilbert & Hotchkiss*, no. 28,918; swale near mouth of brook, Watts Bight, *Pease, Griscom, Gilbert & Hotchkiss*, no. 28,901; peaty limestone barrens back of Big Brook, *Fernald & Long*, no. 28,915; sandy and gravelly margin of Big Brook, *Fernald, Wiegand, Long & Gilbert*, no. 28,916. Quebec: River Kovik, Hudson Straits, *Low*, no. 23,026 (Can.); Little Whale River, *Low*, no. 63,245 (Can.). Alberta: North Fork of the Saskatchewan, 6 miles above North Branch, *S. Brown*, no. 1024; Upper Maligne Valley, *S. Brown*, no. 1145; Maligne Lake, *S. Brown*, no. 1184; all as *P. borealis;* damp places, Kicking Horse Pass, *Dawson*, no. 15,826 (Can.). British Columbia: shore of Atlin Lake, *Guilliam*, no. 101,403 (Can.). Alaska: swamps, Popoff Island, Shumagin Islands, June 28, 1872, *M. W. Harrington*.

The name forma *violacea* is here used for *P. stricta*, var. *groenlandica* Warming (discussed in detail under *P. stricta*, p. 67). Forma *violacea* is most probably the true philogenetic color-form of *P. egaliksensis*, the white-flowered plant, originally described, being a presumable albino, such as we get in the normally lilac-flowered *P. mistassinica;* and, treated as a mere color-form, the name forma *violacea* is more appropriate to it than would be the name originally given by Warming. The plant, changing its rank from variety to forma, does not necessarily have to retain an inappropriate name.

W. W. Smith & Forest, in their *Sections of the Genus Primula* (Notes Roy. Bot. Gard. Edinb. xvi. no. lxxvi. 24), which comes to hand while this is going through the press, treat *P. egaliksensis* (using the later and incorrect spelling *P. egalliccensis*) as a species but under *P. farinosa* enumerate among the subspecies (listed as binomials in violation of general botanical usage and of the International Rules of Botanical Nomenclature) a "*P. groenlandica*, Warming." In the index, however, they definitely give "*P. groenlandica*" as a "Species." Warming, of course, had no such species, nor did he have a subspecies of *P. farinosa*. He published *P. stricta*

var. *groenlandica*, and, as the specimens show, his plant was a violet-flowered *P. egaliksensis*.

P. egaliksensis has many times been confused with *P. sibirica*, to which it is more closely allied than to other species. Like *P. sibirica* it has long-petioled, mostly entire, thin and dilated leaves, broad and often flat involucral bracts, copiously glandular-ciliate calyx-lobes, deeply notched corolla-lobes, and very slender capsules; but in *P. sibirica* the involucral bracts are usually longer and more dilated upward (often slightly obovate) and they have more prolonged and narrower auricles; the calyx is longer (5–8 mm. long); the corolla is much larger (1–1.8 cm. broad) and with broader lobes; and the summits of the stamens or (in the long-styled form) the stigma slightly protrude from the throat. *P. sibirica* is a plant of arctic and alpine Eurasia, reaching America only in the high mountains of Alaska and Yukon; *P. egaliksensis* is strictly American, occurring mostly between latitudes 50° and 60° N., though sometimes reaching the Arctic Coast, and found only slightly north of 60° in southern Greenland.

12. P. SIBIRICA Jacq. *Leaves* green, *efarinose, slender-petioled*, 1–7 cm. long; the thin *blade* suborbicular, ovate or elliptic, *rounded at summit, entire*, or obsoletely dentate, *abruptly contracted at base, shorter than to equaling the petiole*, 0.5–2 cm. broad: scape slender, 0.45–1.5 dm. (–3.8 dm. acc. to Busch) high, efarinose: *involucral bracts oblong or narrowly obovate*, 4–11 mm. long, *obtuse or abruptly contracted at tip*, often prolonged at base into *narrow saccate auricles 1–1.5 mm. long:* umbel 1–4 (–8)-flowered: pedicels filiform, 0.7–4 cm. long: calyx efarinose, slenderly campanulate, in maturity 5–8 mm. long, cleft one-third its length into oblong-ovate fulvous-ciliolate lobes: corolla-tube more or less exserted, very slender; the lilac limb 1–1.8 cm. broad, with obcordate or deeply emarginate broadly cuneate or obovate lobes: stigma or summits of anthers slightly exserted from the throat: capsule slenderly cylindric, somewhat narrowed at summit, from slightly exserted to twice the length of the calyx, about 1.5 mm. in diameter: seeds not seen.—Misc. Austr. i. 161 (1778); Lehm. Monogr. Prim. 60, t. 5 (1817); Hook. Bot. Mag. lix. t. 3167 (1832) and lxii. t. 3445 (1835); Duby in DC. Prodr. viii. 43 (1844); Gray, Syn. Fl. N. A. ii. pt. 1: 58 (1878), in small part only; Pax in Engler's Bot. Jahrb. x. 197 (1889); Pax & Knuth in Engler, Pflanzenr. iv[237]. 76, 77, incl. vars. (1905); E. Busch, Fl. Sib. et Orient. Extr. iv. Cem. 65: 61 (1926). *P. finmarchica* Jacq. Misc. Austr. i. 160 (1778). *P. norvegica* Retz. Fl. Scand. Prodr. ed. 2: 55 (1795). *P. intermedia* Ledeb. Mém. Acad. Pétersb. v. 519 (1815). For further synonymy see Pax & Knuth, l. c. and E. Busch, l. c.—Arctic Europe, Ural

Mountains, arctic and central Asia; Alaska and Yukon. ALASKA: Kuskokwim Valley, 1884, *Weinmann;* cited by Pax & Knuth from Lynn Canal. YUKON: Lake Tahko, near head of Yukon River, June 24, 1883, *Schwatka,* no. 81.

The citation by Hooker, Fl. Bor.-Am. ii. 121 (1838) of *P. sibirica* from "Barren country between lat. 60° and 69°, . . . *Dr Richardson*" can hardly be accepted as unquestionably belonging here. Hooker said "I have carefully compared Dr. Richardson's specimen with authentic ones of the European *P. Norvegica,* the Asiatic *P. Sibirica,* and the *P. Egaliccensis* from Hornemann himself, and there can be no question about the propriety of referring them all to one and the same species." *P. egaliksensis,* however, is now known to be quite distinct from *P. sibirica* and specimens before me show it from several stations between the west shore of Hudson Bay (Churchill, lat. 58° 51′) and Alaska. It is most probable, then, that Hooker's *P. sibirica* was *P. egaliksensis;* for both the white- and purple- or violet-flowered plants of the latter have been repeatedly misidentified as *P. sibirica.* The identity of the violet-flowered *P. egaliksensis* is discussed in the comments upon *P. stricta,* var. *groenlandica* Warm. on p. 67.

The citations "*Pr. integrifolia* Oeder in Fl. Danica t. 188 (1767)" and "*Pr. rotundifolia* Pallas, Reise Prov. russ. Reiches III. (1776) 223" are given by Pax & Knuth in the synonymy; and the first is made the basis of the varietal combination, *P. sibirica,* "Var. β. *integrifolia* (Oeder) Pax." Both these names would, thus, appear to have been published earlier than *P. sibirica,* but examination of the original publications at once shows that they cannot be taken up to displace it.

Oeder did not publish the binomial *P. integrifolia.* Accompanying a recognizable plate of *P. sibirica* was the text:

"TAB. CLXXXVIII.

Auricula ursi IV. Clus. pann. 349. . . .
Primula foliis carnosis glabris integerrimis. Hall. Helv. 485.
Primula, integrifolia, *foliis integerrimis glabris oblongis, calycibus tubulosis obtusis.* Linn. Sp. pl. 205. . . .
Locus. In Finmarkia, . . ."

Only by the Roman type of "integrifolia" did Oeder distinguish that single word of a polynomial derived from the Linnean diagnosis of *P. integrifolia* L. Sp. Pl. i. 144 (1753), a species of southern Europe wholly distinct from *P. sibirica.* Oeder misidentified the Finmark

plant with *P. integrifolia* L. and certainly was not proposing a new species. Incidentally his "*Primula,* integrifolia, *foliis integerrimis*" was the third of a series of names and would technically be "published in synonymy"; and, furthermore, it is not clear that Oeder was at that time following binomial nomenclature. The emphasis by typography on certain adjectives was not uniformly confined to a single "specific" name. Thus, in the same fascicle we find "*Campanula alpina linifolia caerulea* C. B. Prodr. 34" with the synonym "*Campanulae,* rotundifoliae, varietas. Linn. Sp. pl. 232" (Tab. clxxxix); "*Arthritica hiberna.* Gesn." . . . with the synonym "*Primula,* veris, acaulis, *foliis dentatis rugosis*" (Tab. cxciv) and "*Medica echinata minima.* J. B. . . . " with the synonym "*Medicago* polymorpha minima. Linn. Sp. pl." (Tab. ccxi); while in some cases (Tabs. ccxiv, ccxxxii, ccxxxiii) no roman type was used. It is, therefore, very clear that Oeder had in these early fascicles of *Flora Danica* no clear-cut intention to use binomials exclusively and such as crept in in synonymy were merely "accidental" binomials. At any rate, the name *Primula integrifolia,* already validly used by Linnaeus for another species could not be used for a later species and it is unfortunate that in making Oeder's misidentification of *Primula integrifolia* L. the basis of a variety of *P. sibirica* Pax should have excluded perfectly valid varietal combinations. The first unequivocal varietal name for var. *integrifolia* Pax (1905) seems to be var. *kashmiriana* Hook. f. Bot. Mag. cvi. t. 6493 (1880).

The name *Primula rotundifolia* Pallas has no nomenclatorial status. It was used casually and without diagnosis in the running text of his *Reise;* and combinations based upon it should be excluded: such a name as *P. sibirica,* var. *rotundifolia* (Pall.) Pax in Engler's Bot. Jahrb. x. 197 (1889).

Identities of Numbered Exsiccatae cited

1, *P. stricta*
2, *P. laurentiana*
2a, *P.* " forma *chlorophylla*
3, *P. incana*
4, *P. decipiens*
5, *P. specuicola*
6, *P. intercedens*
7, *P. ajanensis*
8, *P. mistassinica*
8a, " forma *leucantha*
8b, *P.* " var. *noveboracensis*
9, *P. parvifolia*
10, *P. borealis*
11, *P. egaliksensis*
11a, *P.* " forma *violacea*
12, *P. sibirica*

Archibald, O. L., no. 69,371 (*8*).
Bailey, L. H., no. 477 (*6*).
Baker, no. 361 (*3*).
Bell, J. M., no. 22,955 (*11*); 22,956 (*8*).

Bell, Robert, no. 15,829 (*1*).
Bissell, Bean, White & Linder, no. 22,234 (*2*).
Blaisdell, no. 129 (*9*).
Blankinship, no. 727 (*3*).
Bowdoin College Exped., no. 103 (*11*); 104 (*2*).
Brown, S., no. 13 (*8*); 900 (*8*); 919 (*8*); 1024 (*11a*); 1107 (*1*); 1145 (*11a*); 1184 (*11a*).
Butters & Rosendahl, nos. 1327 and 1434 (*8*).
Cairnes, C. E., no. 89,722 (*1*).
Chamberlain, no. 298 (*8*).
Collins, Fernald & Pease, nos. 5319, 5320, 5434, 5435, 5554 (*2*).
Cooper, no. 55 (*8*).
Cox & O'Neill, no. 581 (*1*).
Cushman & Sanford, no. 1515 (*2*).
Dawson, no. 15,826 (*11a*); 15,844 (*8*).
Dodge, C. K., no. 3 (*6*).
Dowling, no. 34, 525 (*11*); 34,526 (*1*).
Eames, A. J., no. 4804 (*8b*).
Eastwood, no. 68 (*5*).
Fernald, nos. 82, 2427, 2428 (*8*).
Fernald, Bartram, Long & Fassett, no. 24,327 (*2*).
Fernald & Collins, no. 246 (*2*); 707 and 708 (*8*); 1145 (*8*); 1147, 1148 and 1149 (*2*).
Fernald, Dodge & Smith, no. 25,983 (*8*).
Fernald & Gilbert, no. 28, 894 (*11*); 28,917 (*11a*).
Fernald, Gilbert & Hotchkiss, no. 28,919 (*11a*).
Fernald, Griscom & Gilbert, no. 28,892 (*11*).
Fernald & Long, no. 28,899 (*11*); 28,911 (*2a*); 28,912 (*2*); 28,915 (*11a*).
Fernald, Long & Dunbar, no. 26,955 (*2a*); 26,956 (*2*); 26,957 (*2a*); 26,958 and 26,959 (*8*); 26,960, 26,961 and 26,962 (*11*).
Fernald, Long & Fogg, no. 375 (*2*).
Fernald & Pease, nos. 25,232 and 25,233 (*2*).
Fernald & St. John, no. 10,681 (*8a*); 10,861 (*8*).
Fernald & Wiegand, no. 3881 (*8a*); 3885–3890 (*2*); 6071 and 6072 (*8a*).
Fernald, Wiegand & Bartram, no. 6068 (*2*).
Fernald, Wiegand, Bartram & Darlington, no. 6070 (*8a*).
Fernald, Wiegand & Darlington, no. 6069 (*2*).
Fernald, Wiegand & Hotchkiss, no. 28,902 (*11*).
Fernald, Wiegand & Long, no. 28,895 (*11*); 28,900 (*11*); 28,914 (*2*).
Fernald, Wiegand, Long & Gilbert, no. 28,916 (*11a*).
Fernald, Wiegand, Long, Gilbert & Hotchkiss, no. 28,898 (*11*); 28,913 (*2a*).
Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss, no. 28,891 (*8a*); 28,905 (*2*).
Gaetz, H. H., no. 7476 (*3*).
Gorman, no. 1052 (*1* and *11*).
Griscom, Mackenzie & Smith, no. 25,981 (*2*).
Guilliam, no. 101,403 (*11a*).
Hall & Harbour, no. 378 (*3*).
Harrington, W. H., no. 644 (*2*).
Heacock, no. 14 (*8*).
House, no. 6911 (*8b*).
Howe, C. F., no. 1019 (*8*).
Hughes, E. L., no. 45 (*3*).
Johansen, Frits, no. 50 (*10*); 56 (*10*); 119 (*10*); 265 (*10*); 347 (*1*); 369 (*1*); 533 (*10*); 103,287 (*2*).
Low, A. P., no. 6035 (*8*); 23,026 (*11a*); 24,529 (*1*); 63,242 (*1*); 63,243 (*11*); 63,244 (*1*); 63,245 (*11a*).
Long & Gilbert, no. 28,893 (*11*).

Lyon, H. L., no. 924 (*6*).
MacDaniels, no. 3020 (*8b*).
Mackenzie & Griscom, no. 10,402 (*2*); 10,405 (*8a*).
Macoun, J., no. 5313 (*3*); 11,776 (*2*); 12,211 (*2*); 12,742 (*2*); 12,726 (*8*); 15,830 (*2*); 15,833 (*2*); 15,837 (*2*); 15,838 (*2*); 15,841 (*8*); 15,842 (*8*); 15,846 (*6* and *8*); 22,545 (*8*); 24,528 (*3*); 54,260 (*6*); 68,725 (*8*); 81,152 (*2*); 88,032 (*8a*); 101,401 (*3*).
Macoun, J. M., no. 15,831 (*1*); 15,847 (*11*); 15,850 (*1*); 68,948 (*8a*); 68,949 (*2*); 79,388 (*1*); 79,390 (*11*).
Malte & Watson, no. 118,331 (*3*), 118,333 (*8*).
Merrill & Wilcox, nos. 749, 990 and 1039 (*3*).
Moodie, no. 942 (*3*).
Nelson, nos. 1871 and 1961 (*3*).
Payson & Payson, nos. 1735 and 2648 (*3*).
Pease, nos. 2248, 17,971 and 18,003 (*8*).
Pease, Griscom, Gilbert & Hotchkiss, nos. 28,896 and 28,897 (*11*); 28,901 (*11a*).
Pease & Long, no. 28,903 (*11*); 28,907 (*2*).
Pease, Long & Gilbert, no. 28,890 (*8a*).
Pease & Smith, no. 25,982 (*8*).
Robinson, Ralph, no. 102 (*2*).
Rosendahl, no. 4238 (*8*).
Rosendahl & Butters, nos. 1327, 1434 and 4643 (*8*).
Sanson, no. 22,140 (*8*).
Schwatka, no. 81 (*12*).
Scribner, no. 143 (*3*).
Sheldon, E. P., no. 4400 (*6*); 4768 (*8*); 4948 (*8*).
Spreadborough, no. 14,420 (*11*); 14,421 (*1*); 19,852 (*3*); 34,449 (*11*); 62,554 (*1*); 62,555 (*1*); 62,556 (*8*).
Stecker, no. 78 (*1*).
St. John, no. 90,674 (*2*); 90,675 (*2*); 90,676 (*8*); 90,677 (*11*).
St. John & Nichols, no. 2444 (*8*).
Stringer, nos. 14,423, 62,251 (*10*).
Taylor, Elizabeth, no. 38 (*3*); 87 (*1*); 110 (*3*).
Tyrrell, no. 15,840 (*8*).
Victorin, nos. 131 and 4188 (*2*); 16,722 (*8*).
Victorin & Rolland, nos. 18,418 and 18,419 (*11*); 18,421 (*2a*); 18,465 and 18,485 (*2*); 21,830 (*11*); 21,832 (*2*); 25,107 (*8*); 25,109 (*11*); 25,139 (*2*).
Victorin, Rolland, Brunel & Rousseau, nos. 17,642 and 17,643 (*2*); 17,645 (*8*).
Victorin, Rolland & Louis-Marie, no. 21,831 (*8*).
Waghorne, no. 5 (*8a*); 15,849 (*11*).
Walker, E. P., no. 1052 (*11*).
Wetmore, no. 103,037 (2).
Wiegand, Gilbert & Hotchkiss, no. 28,908 (*2a*); 28,918 (*11a*).
Wiegand & Hotchkiss, no. 28,904 (*2a*).
Wiegand & Long, no. 28,909 (*2a*).

Explanation of Plate 169.

Primula laurentiana × ¾. Photograph taken by *Professor J. F. Collins* at the type-locality, Bic, Quebec.

PRIMULA LAURENTIANA × ¾

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RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE—VII

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RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE—VII.

Since publishing the preceding paper in this series, the writer has had access to many sources of further information concerning the *Eupatorieae*. During the summer of 1927 he visited, chiefly for the study of this group, the great herbaria in Zurich, Geneva (both at the Botanic Garden and at the University of that city), Paris, Berlin, South Kensington, and Kew, receiving at all these places permission to examine and photograph specimens without limit and to make dissections where needful to their precise identification. He was also permitted to borrow from these herbaria much undetermined material for more extended study on his return to Cambridge. He wishes here to record his gratitude for the many favors shown him and to express his sincere thanks to the directors of the herbaria at the botanical centers mentioned.

As in former papers of the series the source of the specimens studied is indicated in the text by abbreviations to show the herbaria to which they belong (K. for Kew, BM. for the British Museum of Natural History, Par. for the Museum of Natural History at Paris, Brl. for the Botanical Museum at Berlin-Dahlem, Gen. for the Conservatory and Botanic Garden at Geneva, Univ. Gen. for the University of Geneva, etc.).

Besides material seen on his journey or subsequently lent by European establishments, the writer has seen much material from American sources. Through many loans, gifts, or exchanges his work has been constantly aided, as for many years, by the New York Botanical Garden, the United States National Herbarium, the Academy of Natural Sciences at Philadelphia, the Field Museum, Missouri Botanical Garden, California Academy and University of California.

He would furthermore express particular gratitude for aid received from several South American sources. Thus, Professor Miguel Lillo, Director of the Museum of Natural History at the University of Tucumán, has most kindly sent to the Gray Herbarium an extended and very discriminatingly selected series of specimens to illustrate the *Eupatorieae* of the Argentine Republic; and Professor L. R. Parodi of the Faculty of Agronomy and Veterinary Science at Buenos Aires has contributed material of much interest from different parts of the Argentine Republic. These sendings, together with an admirably prepared and carefully identified series of specimens recently acquired from Mr. S. Venturi, are doing much to clarify points

hitherto obscure through lack of adequate Argentine material. From Peru some specimens possessing high interest and including several novelties have been received for study (through the Field Museum) from Professor A. Weberbauer and (directly or through the United States National Museum) from Professor F. L. Herrera of the University at Cuzco.

Through a loan from the University of Minnesota it has been possible to examine some further numbers of the admirable Brazilian collection made some years ago by the late Professor E. W. D. Holway.

A notable collection, secured in western Jalisco by Mrs. Ines Mexia while on an expedition encouraged and aided by the University of California, has yielded several *Eupatoriae* of high interest, including a new genus of marked character and several species of great rarity rediscovered after many years.

The most noteworthy single source of the material treated in the following pages, however, has been the collection made by Messrs. Ellsworth P. Killip and Albert C. Smith on their recent journey to northern and northeastern Colombia—an expedition undertaken and exceptionally well carried out by these collectors under the auspices of the New York Botanical Garden, the United States National Museum, the Arnold Arboretum and the Gray Herbarium. The *Eupatorieae* alone of this collection amounted to 218 numbers, representing 82 different plants, including 10 new species, 11 new varieties and forms, 1 new hybrid and several specimens showing important extensions of range.

The following diagnoses and notes are designed to give published record to such new or otherwise notable plants as it has thus far been possible to identify from the extensive and varied material indicated above.

PIQUERIA GALIOIDES DC. Prod. v. 105 (1836); Robinson, Proc. Am. Acad. xlii. 11 (1906); also Contrib. Gray Herb. lxxvii. 4 (1926). Another specimen of this rarely collected Peruvian plant has been recently examined by the writer, namely Prof. Weberbauer's no. 5379 in the herbarium of the Botanical Museum at Berlin. The species was originally based by De Candolle upon fragmentary material, showing only the inflorescence and a few of the uppermost leaves, which were described by him thus "foliis linearibus integerrimis subenerviis" and "Folia 8–10 lin. longa, vix lineam lata." Better material now at hand, both from the recent collection of Dr. Pennell (mentioned in Contrib. Gray Herb. lxxvii. 4) and Prof. Weberbauer's specimen here reported, shows that the fully developed cauline leaves

become 3 cm. long, have a distinct midnerve, and are often provided on one or both sides with from one to three salient sharp teeth. De Candolle stated that the heads were 3-flowered, but dissection of several shows that they vary from 2-flowered to 4-flowered on the same individual. There seems no reasonable doubt that the material secured by Pennell and by Weberbauer is conspecific with that long ago obtained by Haenke. Prof. Weberbauer's admirable field notes add several details to the knowledge of this slightly known plant. They are as follows: "Tracht: Strauch, ½ m. hoch. Blütenfarbe: weiss. Fundort: westliche Andenhänge zwischen 13° und 14° südl. Breite, über dem Hafen Pisco: Pampano. Standort: steiniger Boden mit ganz vereinzelten Pflanzen (hauptsächlich einjährige Kräuter, regengrüne Sträucher und Cacteen). 1200–1300 m., Mai 1910."

Mexianthus, gen. nov. *Compositarum.* Capitula homogama discoidea uniflora, flosculis hermaphroditis. Involucrum cylindratum, squamis paucis inaequalibus valde imbricatis scariosis subhyalinis. Corolla regularis tubulosa, faucibus turbinato-campanulatis, limbi dentibus 5 brevibus recurvatis. Antherae oblongae leviter connatae apice omnino exappendiculatae basi rotundatae vel obscure cordatae. Styli rami subfiliformes apicem versus leviter clavatim incrassati. Achaenia graciliter obovoideo-subprismatica 5-costata. Pappus e squamis 5–7 oblongis laciniatis obtusis basin versus plus minusve connatis compositus.—Suffrutex, foliis alternis. Capitula parva uniflora sessilia in glomerulos globosos capitiformes paniculatos disposita. Species hucusque cognita unica mexicana.

M. mexicanus, spec. nov., erectus 6 dm. vel ultra altitudine aspectu glaber; caule basi lignoso tereti juventate obscure puberulo tardius glabrato; foliis alternis petiolatis utroque acuminatis serrato-dentatis supra basin pinnatim 5-nervatis utrinque viridibus supra parce hirtis subtus subglabris membranaceis 8–12 cm. longis 4–7 cm. latis; petiolo gracili 1–2 cm. longo apicem versus alato; inflorescentia laxa paniculata; glomerulis graciliter pedunculatis globosis ca. 15–40-capitulatis 7–8 mm. diametro; capitulis arcte sessilibus unifloris; involucri squamis 3(–5) inaequalibus obovato-oblongis valde imbricatis tenuibus scariosis apice rotundatis glabris; corolla alba glabra; tubo proprio ca. 0.5 mm. longo; faucibus turbinato-campanulatis ca. 0.9 mm. longis; dentibus limbi 0.3–0.4 mm. longis; achaeniis nigris 2–2.5 mm. longis apicem versus paullo hispidulis; pappi squamis ca. 0.5 mm. longis.—MEXICO: Jalisco: sandy soil near stream, Arroyo del Chorillo, Quimixto, alt. 60 m., Dec. 1, 1926, *Ynes Mexia*, no. 1202 (TYPE, Gr., U. S.).

This notable plant curiously simulates in habit and inflorescence

the anomalous *Eupatorium monanthum* Sch.-Bip., which also has 1-flowered heads, sessile in spherical glomerules, but on closer examination the plant here described proves entirely distinct, not only specifically but as to genus, for it has a scale-pappus entirely different from the fine bristle-pappus of *Eupatorium*. Furthermore, its anthers are strictly exappendiculate at the apex, showing thus the characteristic feature of the *Piquerinae*. In this subtribe the plant falls with the West Indian *Phania*, the Mexican *Ageratella*, and the new Peruvian genus *Trychinolepis*, described below. From all these, it is amply distinguished by its compound heads, single floret, and scarious few-scaled involucre, as well as in its more ample foliage, and in many minor details.

It is a pleasure to dedicate this remarkable plant to its discoverer, Mrs. Ynes Mexia, whose courageous exploration of little known portions of the Sierra Madre has brought to light many plants new to science or otherwise of special interest.

Trychinolepis, gen. nov. *Compositarum*. Capitula homogama tubuliflora pauciflora. Involucrum cylindratum; squamis paucis subaequalibus angustis vix imbricatis. Receptaculum planum nudum. Corollae aequales regulares, tubo proprio fauces vix ampliatas subaequante, limbo brevi 5-fido, lobis anguste deltoideis recurvatis. Antherae vix connatae apice exappendiculatae basi integrae. Styli rami longi filiformes maturitate valde recurvati apicem versus subabrupte clavato-incrassati et nigrescentes. Achaenia 5-angulata. Pappus e squamis paucis scariosis profunde fimbriato-laciniatis compositus.—Frutex sublaevis. Folia opposita dentata. Capitula parva numerosissima in thyrsum ovoideum disposita. Floscula 4–5. Species hucusque cognita unica aliquantum xerophytica andina peruviana. Nomen e τρύχινος, laceratus, et λεπίς, squama, derivatum.

T. Hoppii, spec. nov., fruticosa obscure sparseque puberula; caule tereti pallido juventate cum globulis resinosis sparsis ornato maturitate laevissimo; foliis breviter petiolatis rhombeis acutis 3-nervatis argute serrato-dentatis (basi cuneata excepta) firmiter membranaceis utrinque viridibus juventate cum globulis resinosis adspersis maturitate breviter obscureque hirtellis 3.5–5 cm. longis 1–2 cm. latis saepe in axillis proliferis; thyrso terminali ca. 8 cm. alto et crasso; capitulis 4–5-floris 7 mm. longis aliis sessilibus aliis breviter pedicellatis; involucri squamis 4–5 lineari-oblongis acutis stramineo-viridibus paullo granulatis; corollis ca. 3 mm. longis; tubo proprio 1.5 mm. longo pallido; faucibus subaequilongis purpureis granulatis; dentibus limbi albis; achaeniis in angulis hirtellis; pappi squamis ca. 5 irregulariter laciniatis 1–1.2 mm. longis corollam vix dimidio aequantibus.—

PERU: on rocks and sand, Arequipa, alt. 2500–2800 m., July 1925, *Werner Hopp*, no. 28 (TYPE, in herb. Bot. Mus. Brl., phot. and slight fragm. Gr.).

This interesting and rather perplexing plant was found by the writer among some still undetermined specimens at the Botanical Museum in Berlin and it was kindly lent to him for more detailed examination in Cambridge. It has a very close habital resemblance to several species of *Ophryosporus* and like that genus has the anthers unappendaged at the summit. However, the pappus is very different, being composed of scales instead of hairs and being much shorter relatively to the corolla than is the case in *Ophryosporus*. *Trychinolepis* has a pappus exceedingly like that of the small West Indian genus *Phania*, but the habit is quite different. The heads of *Phania* are many-flowered and disposed in a rather open inflorescence, while in *Trychinolepis* they are 4–5-flowered and borne in a dense thyrse. In *Phania* the style-tips are less thickened and are not in the same degree nigrescent. In *Phania* the corolla is white or nearly so; in *Trychinolepis* the throat is rather deep purple. These differences (together with the wide geographic separation) make one hesitate to refer to *Phania* the Peruvian xerophyte here in question.

OXYLOBUS GLANDULIFERUS (Sch.-Bip.) Gray. The writer, Proc. Am. Acad. xlix. 486 (1913), has already drawn attention to the anomalous history of this species and shown that its type was Liebmann's no. 238, since that was the material from which it was first described and published by Hemsley. Though Schultz-Bipontinus had (in herb.) applied to the same specimen the name *Ageratum glanduliferum* var. *albiflorum*, his manuscript name has of course no validity. The white-flowered form (since it was obviously the basis of the specific description) becomes *ipso facto* the typical form of the species.

An occurrence of this species is western Venezuela has long been known from the Sierra Nevada, Merida, *Funck & Schlim*, no. 1155 (K., Par., Gen., fragm. Gr.). From the collectors' notes on the label it is learned that here also the flowers were white.

It is now possible to report the occurrence of the species in Colombia, where it appears in two color forms, as follows:

Forma a. **typicus**, corollis (saltim limbo) albis.—*Ageratum glanduliferum* β. *albiflorum* Sch.-Bip. ex Gray, Proc. Am. Acad. xv. 26 (1879), without char. *Oxylobus glanduliferus* var. *albiflorus* Klatt, Leopoldina, xx. 75 (1884).—COLOMBIA: Dept. Santander: Páramo de Romeral, alt. 3800–4100 m., Jan. 29–30, 1927, *Killip & Smith*, no. 18,526 (Gr.). Also southern Mexico and eastern Venezuela.

Forma b. **coloratus**, forma nova, corollis coloratis; tubo purpureo;

dentibus limbi roseis.—COLOMBIA: Dept. Santander: Páramo de Santurban, near Vetas, alt. 3950–4160 m., Jan. 17, 1927, *Killip & Smith*, no. 17,519 (Gr.).

FLEISCHMANNIA SCHAFFNERI Gray, Proc. Am. Acad. xvi. 101 (1880). This species was founded upon a specimen collected near San Francisco in the valley of San Luis Potosi more than half a century ago. No subsequent record of the species is known to the writer. It seems well worth while, therefore, to mention its rediscovery by Mrs. Mexia at a somewhat distant locality in another Mexican state, as follows: JALISCO: an erect herb, in crevices of rocks by a streamside, Real Alto; trail to Arroyo del Jaguay, Sierra Madre Occidental, alt. 2500 m., Feb. 25, 1927, *Ynes Mexia*, no. 1752 (Gr., US.).

Stevia jaliscensis, spec. nov., fruticosa erecta verisimiliter 1–2 m. altitudine; caule juventate tomentello maturitate prope basin usque ad 1 cm. crasso; ligno duro albo; cortice firmo atrogriseo longitudinaliter rugoso; foliis oppositis petiolatis ovato-lanceolatis obtusis vel acutis crenatis vel subirregulariter serrulatis basin versus integris abruptius cuneatis supra puberulis subtus griseo-tomentellis penniveniis 5–10 cm. longis 1.5–3.5 cm. latis; petiolo 12–25 mm. longo; corymbo composito terminali convexo 8–22 cm. diametro; capitulis 12–14 mm. longis in cymulas 3-capitulatas dispositis; capitulo terminali sessili; duobus lateralibus distincte pedicellatis; involucri squamis lineari-oblongis abrupte acutatis dorso patenter puberulis vel tomentellis; capillis albis attenuatis eglandularibus; corollis albis vel albidis; achaeniis uniformibus cum coronula subintegra scariosa ca. 0.4 mm. alta coronatis.—MEXICO: Jalisco: hills near Guadalajara, alt. about 1525 m., *Palmer* ('86) 224 (Gr., Par.), 673 (Gr., Par., K.); *Pringle*, nos. 1773 (TYPE, Gr., ISOTYPES, Gen., Par., K.), 9984 (Gr., K.).

A plant formerly identified and several times distributed as *S. subpubescens* Lag., but differing in its longer petioles, somewhat looser inflorescence, relatively broader and often obtuse leaves, and subtomentellous phyllaries.

S. mitopoda, spec. nov., herbacea verisimiliter annua erecta diffuse ramosa 4 dm. vel ultra altitudine gracillima; caule tenui tereti pallide brunneo obscure puberulo subglabrato leviter flexuoso; foliis oppositis vel subopppositis vel in inflorescentia alternis, inferioribus ut videtur caducis, superioribus lanceolatis subsessilibus basin apicemque versus attenuatis integris lateraliter serratis a basi trinervatis tenuiter membranaceis utrinque viridibus glabris obscurissime puncticulatis 2–3.5 cm. longis 6–9 mm. latis; panicula diffusissima

obscure albo-puberula non glandulifera; pedicellis filiformibus plerisque 1–1.8 cm. longis leviter curvatis; capitulis saepe nutantibus 5–6 mm. longis 5-floris; involucri squamis anguste lanceolatis acutis tenuibus viridibus minute albido-puberulis, pilis non glanduliferis; corollis albis bilabiatis; lobis 3 limbi exterioribus patentibus lanceolato-oblongis 1–1.4 mm. longis, lobis 2 interioribus suberectis deltoideo-lanceolatis 0.6–0.9 mm. longis; faucibus ca. 2 mm. longis; tubo proprio ca. 0.4 mm. longo; achaeniis nigris 2.5 mm. longis in angulis sursum scabratis, omnibus cum cupula denticulata 0.2 mm. alta coronatis; achaenio uno biaristato, duobus uniaristatis, duobus exaristatis; aristis violascentibus tenuibus minute barbellatis ca. 2.8 mm. longis.—MEXICO: on stony slopes, Rio Balsas, Guerrero, 20 Oct. 1904, *C. & E. Seler*, no. 4286 (TYPE, Bot. Mus. Berlin, phot. and fragm. Gr.).

This highly characteristic species is obviously most closely related to *S. Aschenborniana* Sch.-Bip., which, however, has somewhat larger heads, deep purple corolla-throat, copious gland-tipped puberulence, and usually four of its achenes triaristate. From the also related *S. micrantha* Lag., *S. mitopoda* differs conspicuously in its much more diffuse inflorescence and larger bilabiate corolla.

S. MONARDAEFOLIA HBK. Nov. Gen. et Spec. iv. 147 (1820). With this species there may be doubtfully associated a much more slender plant, which produces runners at the base and which has smaller and less pubescent leaves. In all the more important technical characters of inflorescence, florets, achenes, etc., it is in essential agreement with the typical variety. However, the considerable differences in its habit, pubescence, stature, etc., seem to warrant at least a varietal recognition. The two varieties may be distinguished thus:

Var. α. **typica**, erecta 6–12 dm. alta, turionibus ut videtur nullis; foliis maximis 4–12 cm. longis subtus in superficie et praecipue in nervis venisque griseo-pubescentibus.—*S. monardaefolia* HBK. l. c.

Var.? β. **repens**, var. nov., multo gracilior 3–4 dm. alta; basi distincte repens et stolonifera; foliis 3–4 cm. longis utrinque viridibus subtus in nervis venisque parce hirtis.—MEXICO: Jalisco: erect, common, Real Alto, Arroyo de las Cruzes, alt. 2500 m., *Ynes Mexia*, no. 1610 (Gr., US.). Possibly a distinct species but marked chiefly by vegetative traits of doubtful constancy.

S. Nelsonii, spec. nov., fruticosa erecta vel adscendens verisimiliter 1 m. altitudine in foliis involucrisque subvernicosa; caule et ramis erectis atropurpureis primo griseo-tomentellis tardius glabratis; foliis lanceolato-oblongis serratis utroque acutis vel acuminatis

coriaceis penniveniis glabris viscidis 5–11 cm. longis 1.2–2.2 cm. latis utrinque prominulenter reticulatis; inflorescentia terminali e glomerulis magnis densis pluricapitulatis composita; involucri squamis linearioblongis acutis vel subobtusis obscure glandulari-punctatis; corollae tubo rubescenti; dentibus limbi parvis albis; achaeniis uniformibus omnibus coronulatis exaristatis.—MEXICO: Michoacan: north slope of Mt. Patamban, alt. 2750–3350 m., *E. W. Nelson*, no. 6579 (TYPE, in Gray Herb.). A shrubby thickish-leaved species near *S. phlebophylla* Gray, but having narrower more lanceolate leaves (with more widely spreading veins and less prominulent veinlets) and subglabrous involucre.

S. (§ Podocephalae) orizabensis, spec. nov., perennis gracilis verisimiliter subherbacea; ramis teretibus purpurascentibus juventate inconspicue puberulis tardius glabratis; internodiis 6–7 cm. longis; foliis oppositis (eis inflorescentiae plerisque alternis), infimis rhombeo-ovatis graciliter petiolatis, superioribus oblongo-lanceolatis sessilibus sed basin versus angustatis quasi alato-petiolatis, omnibus integerrimis apice rotundatis vel saepius acutis membranaceis utrinque viridibus et glabris 4–8.5 cm. longis 1–3.5 cm. latis multo supra basin 3-nervatis; inflorescentia laxa paniculata cum foliis multo reductis bracteiformibus sessilibus elliptico-lanceolatis ornata 1.5 dm. alta et crassa; pedicellis gracilibus minute glandulari-puberulis plerisque 4–6 mm. longis; capitulis saepe nutantibus ca. 1 cm. longis 5-floris; involucri squamis 5 lineari-lanceolatis acutis viridibus minute glandulari-puberulis; corollae limbo albo, dentibus 2-nervatis ca. 2 mm. longis et 1.2 mm. latis obtusis; faucibus subcylindratis purpurascentibus ca. 3 mm. longis; tubo proprio paullo contracto ca. 2 mm. longo; achaeniis 3.5 mm. longis similibus omnibus cum cupula scariosa paullo denticulata vix 2 mm. alta coronatis.—*S. laxa* Robinson & Seaton, Proc. Am. Acad. xxviii. 107 (1893), in part, solely as to pl. of Bourgeau, but not as to type.—MEXICO: region of Orizaba, *Botteri*, no. 1125 (BM., K., Gen.); Escamilla, *Bourgeau*, no. 3331 (TYPE, Gr., K., Gen.).

A species in many respects close to *S. micradenia*, but having its leaves more evenly distributed on the stem, the upper internodes less elongated, the upper (relatively narrower) leaves subsessile, and the inflorescence more copiously bracteate.

S. PUNCTATA. The status and confused application of this binomial merit at least a brief discussion. The two uses of this name have been as follows:

No. 1. S. PUNCTATA (Ort.) Pers. Syn. ii. 403 (1807), based upon *Ageratum punctatum* Ort. Dec. 37 (1797).

No. 2. S. PUNCTATA (Jacq.) Sch.-Bip. Linnaea, xxv. 286 (1853), based on *Ageratum punctatum* Jacq. Hort. Schön. iii. 28, t. 300 (1798).

No. 1. This application of the name, though resting upon the earlier synonym, has been pretty generally neglected. It was listed by Steudel in the first edition of his Nomenclator, but in the second edition was reduced to the synonymy of *S. eupatoria* (Spreng.) Willd. Spec. Pl. iii. 1775 (1804), a species based on *Mustelia eupatoria* Spreng. Nachtr. 1, Bot. Gart. Halle, 28 (1801) & Trans. Linn. Soc. vi. 152, t. 13 (1802). Steudel's reduction has been followed by Hemsley, Biol. Cent.-Am. Bot. ii. 85 (1881) and by the Index Kewensis. Of course, if this supposed identity between *Ageratum punctatum* Ort. and *Mustelia eupatoria* Spreng. could be confirmed Ortega's earlier specific name would have to be taken up under *Stevia*, but the writer has found no means of substantiating the identity in question and several traits are mentioned in Ortega's original description which render it doubtful, indeed rather unlikely. From his all too few specific characters it appears that his plant had linear-lanceolate carinate leaves toothed at the apex and narrowed at the base—traits which would agree well enough with many specimens of the variable *S. serrata* Cav., but are by no means appropriate to *S. eupatoria* (Spreng.) Willd. in which the leaves are narrowly oblong, flat (see illustration of Sprengel and note of Schultz "foliis semper planis"), subentire, and not at all narrowed to the rather abruptly contracted base.

It is true, Persoon, when transferring *Ageratum punctatum* Ort. to *Stevia* may well have had some material of *S. eupatoria* before him, but his work is very sketchy and probably hurried, for it will be noticed that while attempting to separate *Ageratum punctatum* Jacq. from the earlier *A. punctatum* Ort., he cites Jacquin's description and plate in the treatment of each of his segregates.

From the facts stated it will be evident that there are no present grounds for replacing *S. eupatoria* (Spreng.) Willd. by *S. punctata* (Ort.) Pers. It would seem more probable that the latter is best placed as a doubtful synonym of *S. serrata* Cav.

No. 2. This application of the binomial, *Stevia punctata*, has been scarcely employed except by Schultz and the plant so designated by him (namely the one with narrowly oblanceolate to linear leaves which are conspicuously toothed, gradually narrowed to the base, and in nature often carinate) has in general and very properly passed under the name *S. serrata* Cav. Ic. iv. 33, t. 355 (1797). Just why Schultz displaced the earlier *S. serrata* Cav. by the later specific name of Jacquin is not clear. It is true, Schultz was interpreting

the species somewhat more broadly than either Jacquin or Cavanilles, but this of course constitutes no ground for changing its name.

From the above it will be seen that no. 2 falls definitely into the synonymy of *S. serrata* Cav., while no. 1 may be more doubtfully disposed of in the same manner.

Symphyopappus compressus (Gardn.), comb. nov. *Eupatorium compressum* Gardn. in Hook. Lond. Jour. Bot. v. 473 (1846); Walp. Rep. vi. 709 (1847). *Symphyopappus polystachyus* Bak. in Mart. Fl. Bras. vi. pt. 2, 368, t. 98 (1876), as to plant described and figured but not as to name-bringing synonym, viz. *Eupatorium polystachyum* DC. which is *E. crenulatum* Spreng. DeCandolle's description as well as the name of his *E. polystachyum*, calling for somewhat spicate or racemelike branches of the inflorescence should, even without further evidence, have prevented Baker from associating this name with the corymbiferous plant described and figured in the Flora Brasiliensis. While recently at the Museum of Natural History in Paris the writer was able to examine and photograph an excellent sheet of the type of De Candolle's *E. polystachyum*, namely "Mus. imp. Bras. sub. n. 488" and found it precisely *E. crenulatum* Spreng., the species treated and illustrated by Baker, l. c. 321, t. 84, as *E. dendroides* Spreng. See Hieron. in Engl. Bot. Jahrb. xxii. 776 (1897). Baker must have been misled by the likeness of the foliage in which there is in fact a fair degree of similarity between these otherwise exceedingly different plants. After discarding the name *polystachyum*, which from its type is quite inapplicable, it appears that the next name applied to the corymbiferous plant was *Eupatorium compressum* Gardn. The plant is somewhat transitional between *Eupatorium* and the segregate genus *Symphyopappus*, but apparently must be classified with the latter if the genera are kept apart.

Eupatorium (§ Subimbricata) Albertosmithii, spec. nov., herbaceum perenne aspectu glabrum 6–9 dm. altum; caule subtereti post exsiccationem multicostato pallide viridi maculis elongatis fuscescentibus ornato albo-medulloso 5 mm. crasso; foliis oppositis petiolatis late subrhombeo-ovatis acuminatis grosse crenatis basin abrupte contractam versus integris utrinque viridibus supra secundum nervos venasque maximas brevissime hirtello-puberulis a puncto supra basin 3-nervatis subtus paullo pallidioribus textura firmiter membranaceis 10–14 cm. longis 8–9 cm. latis venulis subdisjunctim pellucidis; petiolo 2–3 cm. longo apicem versus plus minusve alato; corymbo oppositirameo 3 dm. diametro; ramis curvato-adscendentibus elongatis incurvo-puberulis; bracteis ovatis vel spatulatis vel

(supremis) lanceolato-subulatis multo reductis; capitulis ca. 25-floris 8 mm. longis 3.5–4 mm. diametro arcte sessilibus in glomerulos subsphaericos dispositis; involucri squamis ca. 32 ca. 4–5-seriatim imbricatis albidis glabriusculis eroso-ciliolatis apice rotundatis dorso 3–5-nervatis; corollis cylindratis gracilibus 3.3 mm. longis limbum (vix 0.2 mm. longum) versus subcaeruleo-purpureis; achaeniis 2.5 mm. longis in angulis obscure hirtellis; pappi setis ca. 40 tenuiter capillaribus albis.—COLOMBIA: Dept. Santander: in thickets between Nariño and El Tambor, alt. 150–300 m., Dec. 4, 1926, *Killip & Smith*, no. 14,967 (TYPE, in Gray Herb.).

This species is transitional between §§ *Subimbricata* and *Cylindrocephala*. It shows probable affinity to *E. acuminatum* HBK. and perhaps to *E. morifolium* Mill. Its leaves are thicker and more sparingly and coarsely toothed than in the former and the heads more densely glomerate than in the latter. From both, the species here proposed differs in its much more numerously flowered heads. It is named in honor of one of its discoverers, Mr. Albert C. Smith, who accompanied and effectively aided Mr. Killip upon his recent exploration of northern and eastern Colombia.

E. (§ SUBIMBRICATA) ARBUTIFOLIUM Benth. Pl. Hartw. 199 (1845). This Colombian species, thus far known only from the Department of Cauca, can now be reported from the Departments of Santander and Norte de Santander, where collected by Messrs. Killip & Smith. The recently obtained material falls into two pretty well marked varieties, as follows:

Var. α. **typicum**, ramis ramulisque inflorescentiae patenter copioseque ferrugineo-pubescentibus; pilis articulatis.—*E. arbutifolium* Benth. l. c.—COLOMBIA: Dept. Cauca: in woods near Huambia, *Hartweg*, no. 1100 (K., phot. Gr.); "San Jose," San Antonio, bushy forest, Cordillera Occidental, alt. 2400–2700 m., June 28, 1922, *Pennell & Killip*, no. 7423 (Gr.). Norte de Santander: edge of woods on eastern slope of Páramo del Hatico, between Toledo and Pamplona, alt. 2900 m., Mar. 12, 1927, *Killip & Smith*, no. 20,599 (Gr.), the last a luxuriant form with pubescence and all important characters as in the type, but with somewhat larger leaves, some of them as much as 17 cm. long and 6 cm. wide.

Var. β. **sublaeve**, var. nov., ramis inflorescentiae glabris vel subglabris; ramulis breviter inconspicueque puberulis; aliter var. *typico* simillimum.—COLOMBIA: Dept. Santander: forest near Charta, alt. 2000 m., *Killip & Smith*, nos. 18,870 (Gr.), 18,871 (TYPE, in Gray Herb.); swamp near Charta, *Killip & Smith*, no. 18,906 (Gr.); open bank near La Baja, alt. 2200–2600 m., Jan. 19–28, 1927, *Killip &*

Smith, no. 17,129 (Gr.); wooded banks of the Rio de la Baja, below Baja, alt. 2200–2300 m., *Killip & Smith*, no. 18,288 (Gr.); Mesa de los Santos, alt. 1500 m., Dec. 11–15, 1927, *Killip & Smith*, nos. 15,188 (Gr.), 15,201 (Gr.).

According to field notes of the collectors this smoothish variety sometimes appears as a shrub, 1.3–4 m. in height, sometimes as an "herbaceous vine." Its floral parts are sometimes found to be all white, in other cases the corolla-tube is said to be greenish and the limb white to light pink. The specimens appear to be quite identical as to essentials.

E. BACCHAROIDES HBK., Nov. Gen. et Spec. iv. 132 (1820). This highly characteristic species exhibits two well marked varieties, which may be distinguished thus:

Var. α. **typicum**, foliis utrinque glaberrimis.—Synon. and distrib. as stated by the writer in Proc. Am. Acad. liv. 287 (1918).

Var. β. **araneotectum**, var. nov., foliis supra glabris subtus dense pallideque araneoso-lanatis; pilis implexis ut videtur viscidis sed neque glandulari-capitatis nec conspicue articulatis; aliter var. *typico* simillimum.—COLOMBIA: Dept. Santander: in wood on western slope of Páramo Rico, alt. 3000–3600 m., Jan. 15–19, 1927, *Killip & Smith*, no. 17,230 (Gr.). According to the excellent field-notes of the collectors, this is a viscid shrub 2–3 m. high, with corolla proximally greenish and distally pinkish, with deep pink style-branches. As evidence of intergradation of the two varieties is still lacking, their status is subject to some doubt. However, in all respects other than that of pubescence they appear identical and though the pubescence character is striking it seems not to justify specific separation.

E. baccharoides var. **araneotectum** × **crassiceps.** A plant, which from its intermediate nature seems likely to be a hybrid of this parentage, was collected in COLOMBIA: Dept. Santander: on the western slope of Páramo Rico, alt. 3600 m., Jan. 15–19, 1927, by *Messrs. Killip & Smith*, no. 17,715 (Gr.). It has the same nodding or recurved inflorescence highly characteristic of both its supposed parents, but has heads intermediate both in size and in the number of phyllaries and florets, and has leaves which are neither glabrous as in *E. crassiceps* nor densely arachnoid-lanate as in *E. baccharoides* var. *araneotectum*, but covered (on the lower surface) with a sparse indument composed of hairs of precisely the same nature as those in the variety just mentioned. The inflorescence has many more heads than in *E. crassiceps* but is much less dense than in *E. baccharoides* var. *araneotectum*. It will be noted, furthermore, that both of the supposed parents, as well as the putative hybrid, were collected

in similar paramo conditions in a region traversed by the expedition of Messrs. Killip & Smith between January 15 and 19. Evidences of hybridity have been rarely found in the genus *Eupatorium*, but this case appears probable and a hybrid status seems the best disposition of the intermediate at least until it can be known from more extensive material. Perhaps the best evidence lies in the fact that the intermediate seems to exhibit no trait, however slight, which is not found in one or both of supposed parents, though these themselves differ rather widely especially in the size of the heads.

E. borinquense (Britton), comb. nov. *Osmia borinquensis* Britton, Sci. Surv. Porto Rico and Virgin Ids. vi. 288 (1925). Through the kindness of Dr. Britton the writer has had an opportunity to examine the best available (though somewhat immature) material of this "straggling vine-like shrub" and agrees with Dr. Britton that it represents a species not previously described. However, prolonged study has not revealed any satisfactory boundary between *Eupatorium* and its attempted segregate *Osmia*. Therefore it seems best to place this interesting novelty in the older and more comprehensive genus.

E. Bucheri, nom. nov. Through an unfortunate and much regretted error in copying, this name was published as *E. Ruckeri* by the writer, Contrib. Gray Herb. lxxvii. 35 (1926). As will be readily understood it was the intention to name the plant for its collector. Unfortunately his name, somewhat obscurely recorded on a manuscript label, was mistakenly inferred to be Rucker, but (as is now learned from Dr. N. L. Britton) is in fact Bucher. An orthographic correction of this nature is certainly permissible under Art. 57 of the International Rules of Botanical Nomenclature.

E. (§ Subimbricata) carnosifolium, spec. nov., suffruticosum 2 m. altum; caule tereti robusto medulloso 6 mm. vel ultra diametro pallide brunneo minute papilloso-puberulo et sordescenti; internodiis 1–6 cm. longis; foliis oppositis petiolatis late ovatis obtusis vel rarius acutis grosse crenatis basi abrupte contractis deinde ad petiolum breviter acuminatis supra obscure hirtellis subtus pallidioribus breviter puberulis vel rariter glabris 7–17 cm. longis 4–10 cm. latis textura carneis sed omnino non coriaceis a puncto 1–3 cm. supra basin 3(–5)-nervatis aliter penniveniis; petiolo 1.5–5 cm. longo; inflorescentia terminali 7–20 cm. diametro ad anthesin saepe subdensa sed tardius laxiuscula planiuscula; pedicellis 6–15 mm. longis sordide puberulis; capitulis 50–60-floris ca. 1 cm. altis et 1.2 cm. latis; involucri campanulati squamis ca. 25 subtriseriatim imbricatis, extimis ovatis acutiusculis ca. 3 mm. longis et 1.4 mm. latis dorso

sordide puberulis, intermediis oblongo-lanceolatis subacutis vel acutis 6 mm. longis et 2 mm. latis etiam dorso puberulis, intimis lanceolatis acutis 3-nervatis ciliolatis aliter subglabris ca. 7 mm. longis et 1.2 mm. latis; corollis carneo-roseis tubulatis 4.8 mm. longis summum versus paullo ampliatis; limbo brevi 5-dentato; achaeniis nigris 3 mm. longis glabris; pappi setis ca. 45 flavescenti- vel brunnescenti-albis 4.7 mm. longis.—*Campuloclinium crenatum* Schlecht. ex Mart. Herb. Fl. Bras. 345 (1837), not *E. crenatum* DC., nor Gomez. *Conoclinium mikanioides* Sch.-Bip. in sched. pl. Riedel, acc. to Bak. in Mart. Fl. Bras. vi. pt. 2, 306 (1876) in synon., not *E. mikanioides* Chapm.—Brazil: Bahia: wooded coastal marshes near Ihleos, *Martius Herb. Bras.* no. 668 (type, in Gray Herb., isotype, Mo.); southern part of the province, *Blanchet*, nos. 3124 (Univ. Gen.), 3124A (Gen.). Ceará: Serra de Maranguape, *Ule*, no. 9119 (Brl.). Brazil without indicated locality: *Luschnath*, no. 78 (Brl.), *Riedel* (Gr.).

This plant, long known as a recognizable entity, has had no valid designation. The specific name *crenatum*, given to it with brief diagnosis by Schlechtendal under the now obsolete generic name *Campuloclinium*, cannot be applied under *Eupatorium* because antedated by homonyms. The plant is one of several diverse elements placed by Baker (l. c.) in *E. sordescens* DC., a species which as to its type was exceedingly different, being of § *Eximbricata* and having much smaller about 20-flowered heads and more deltoid-ovate membranaceous leaves. From *E. Lundianum* (*E. Schlechtendalii* DC., *Mikania resinosa* Spreng., *Conoclinium resinosum* Sch.-Bip.) the plant here under discussion differs in its much larger leaves, longer petioles, more pointed outer phyllaries and shorter (sordid rather than rufescent) puberulence.

E. (§ Cylindrocephala) Christieanum Bak. in Mart. Fl. Bras. vi. 298 (1876). While visiting the Kew Herbarium in the summer of 1927, the writer was able to examine the type of this little known species of southern Brazil and to identify with it the puzzling plant of Paraguay and northern Argentina, which he had some months before described as *E. laevigatulum*, Contrib. Gray Herb. lxxvii. 21 (1926), after it had by others been incorrectly referred to *E. graciliflorum* DC. and to *E. Orbignyanum* Klatt. The reduction of *E. laevigatulum* to *E. Christieanum* automatically extends the range of the latter to Paraguay and northern Argentina.

E. (§ Cylindrocephala) columbianum Heer, Mém. Soc. neuchât. Sci. Nat. v. 421 (1913). This Colombian species, said by its author to be common in the Departments of Antioquia and Tolima and subsequently several times collected about Bogotá, can now be

extended to the Departments of Santander and Norte de Santander, where it shows marked variation as follows:

Var. α. **typicum**, capitulis 9–12-floris; foliis crassiusculis supra valde rugoso-bullatis subtus dense sordideque piloso-pubescentibus.—For details of occurrence see Robinson, Proc. Am. Acad. liv. 274 (1918).

Var. β. **umbratile**, var. nov., capitulis 5–7-floris; foliis tenuibus planis vel vix subrugosis brevissime inconspicueque in nervis venisque puberulis.—COLOMBIA: Dept. Santander: in dense forests, Quebrada de Pais, north of La Baja, alt., about 3200 m., *Killip & Smith*, nos. 18,814 (TYPE, in Gray Herb.), 18,796 (Gr.).

Compared alone with the typical variety these numbers might seem to warrant separation as an independent species, but a transitional form is shown by another collection in the same series, namely: Dept. Norte de Santander: eastern slope of Páramo de Santurbán, toward Mutiscua, alt. 3600–3900 m., Feb. 20, 1927, *Killip & Smith*, no. 19,604 (Gr.).

E. COSTARICENSE O. Ktze., Rev. Gen. i. 337 (1891). So far as known to the writer this species, collected by Dr. Kuntze at Angostura, Costarica, in 1874 and described by him in 1891, has never been subsequently recorded. This seems rather strange in consideration of the large amount of field work since accomplished in Costarica —exploration far exceeding in extent and care the hurried collections of Kuntze. It was therefore a matter of much interest to the author to find an unnamed Ecuadorian specimen of the species in some unindentified material at the Botanical Museum in Berlin. The sheet, kindly lent for more careful examination at Cambridge, was there compared with the type of *E. costaricense*, which was on loan from the New York Botanical Garden. The Ecuadorian specimen was collected in tropical vegetation of the Province Esmeralda along the Cachalte River in August, 1904, by the late Father Sodiro, being no. 14 of a small series of *Compositae* sent to Prof. Hieronymus for identification in 1909. Comparison of the specimens of Kuntze and of Sodiro discloses close correspondence even to trifling characteristics. There can be no doubt whatever that the two are specifically identical. The geographic jump from Costarica to Ecuador, while striking, is not to be regarded as anomalous. A number of plants are now known which are common to the cordilleras of these two countries. Father Sodiro's discovery yields another instance of this floral interrelationship and adds another species to the ever lengthening list of South American Eupatoriums.

E. (§ Subimbricata) crassiceps, spec. nov., fruticosum gracile

1.3–4 m. altum glabrum glutinosum; caule firmiter lignoso fusco-brunneo tereti albo-medulloso 5 mm. vel ultra diametro; ramis oppositis patenter adscendentibus; internodiis plerisque 5–20 mm. longis; foliis oppositis breviter petiolatis oblongis obtusis vel subacutis serrulatis basi cuneatis coriaceis penniveniis utrinque glabris sublucidis supra planis subtus reticulato-venulosis 3.5–6 cm. longis 12–22 mm. latis; petiolo 2–4 mm. longo lato atrorubro; inflorescentiis ramos terminantibus curvato-nutantibus vel subpendulis plerumque 3–5-capitatis; pedicellis fusco-brunneis vel -purpureis viscosissimis 2–3.6 cm. longis; capitulis pro genere maximis 1.5–2 cm. longis et crassis multifloseulosis; involucri squamis ca. 35 valde inaequalibus ca. 4-seriatim imbricatis tenuibus viridibus vel purpureis viscosis multistriatulis margine eroso-serrulatis, extimis ovatis, ceteris ovato-oblongis vel oblongis; corollis ca. 8 mm. longis pallide roseis; tubo proprio 1.5–2 mm. longo; faucibus paullo ampliatis ca. 5 mm. longis; limbi dentibus 5 ovatis acutiusculis 0.5 mm. longis; achaeniis nigris sursum praesertim in angulis hispidulis 5.5 mm. longis; pappi setis ca. 35–40 inaequalibus albis acutis sublaevibus.—COLOMBIA: Dept. Santander: edge of Páramo de Santurbán, near Vetas, alt. 3500–4000 m., *Killip & Smith*, no. 17,583 (TYPE, in Gray Herb.); Páramo de Romeral, alt. 3800–4100 m., Jan. 29–30, 1927, *Killip & Smith*, no. 18,534 (Gr.).

A notable species with exceptionally large heads in nutant or recurved inflorescences similar to those of the much smaller-headed *E. baccharoides* HBK.

E. (§ SUBIMBRICATA) DEJECTUM Robinson, Contrib. Gray Herb. lxxvii. 12 (1926). This species was based on a rather fragmentary specimen (in the Museum of Natural History at Paris) collected by d'Orbigny at "Miraflor, "Bolivie." At the time of description no Bolivian place of this name was found on any map or in any atlas of Bolivia available to the writer, and he expressed some doubt whether the locality intended might not have been Miraflores in Argentina. Recently Dr. I. M. Johnston has brought to the writer's attention the fact that a small place in Bolivia called Miraflor is mentioned in the general narrative and shown on the maps of d'Orbigny's explorations. It is situated slightly to the northeast of Potosi. This establishes the type-locality, which had previously been in doubt. The matter is of interest just now as the species has recently been rediscovered at a second and rather remote station as follows: Peru: Dept. Cuzco: in the Sacsahuaman hills, alt. 3600 m., July, 1927, *F. L. Herrera*, no. 1577 (Gr.). The Peruvian material, though collected some 800–900 km. to the northward, is closely identical with the Bolivian.

E. (§ SUBIMBRICATA) DIDYMUM Klatt, Ann. Naturhist. Hofmus. Wien, ix. 356 (1894). Material apparently conspecific with this highly characteristic Bolivian species has recently been received by the author from the Province of Tucumán in the Argentine Republic. The specimens in question formed a part of an exceedingly interesting sending most kindly forwarded by Professor M. Lillo. While agreeing with the original Bolivian material in all significant traits, the Argentinian plant differs in the nature of its pubescence and in consequence the species, as now known, may be varietally divided as follows:

Var. α. **typicum**, ramis juvenilibus et pedicellis et involucri squamis exterioribus puberulis vel subtomentellis cum pilis brevibus acutis eglandularibus.—*E. didymum* Klatt, l. c.—BOLIVIA: La Paz: Prov. Larecaja: Moyabayam near Sorata, *Mandon*, no. 262 (Gr.).

Var. β. **glandulitectum**, var. nov., ramis juvenilibus et pedicellis et involucri squamis extimis breviter puberulis cum pilis brevissimis minutissime glandulari-capitulatis.—ARGENTINA: PROV. Tucumán: Cuesta de San Javier, Aug. 17, 1913, *Castillon*, no. 2960 (Gr.); in same locality, among rocky cliffs, alt. 1100 m., Aug. 1914, ex herb. *M. Lillo*, no. 13,153 (Gr.).

E. (§ Cylindrocephala) farinosum, spec. nov., fruticosum erectum vel reclinatum ramosissimum; caule tereti albo-medulloso juventate patenter pubescenti et cum glandulis minutis lucidis sessilibus ornato post exsiccationem costulato brunnescenti; ramis patentibus curvatis foliosis; foliis oppositis petiolatis deltoideo-ovatis basi subtruncatis integris utroque latere crenato-serratis acutis a basi trinervatis membranaceis bicoloribus supra viridibus incurvato-pubescentibus (pilis densis gracilibus) et sparse cum glandulis globosis adspersis subtus multo pallidioribus in nervis pubescentibus in superficie densissime cum glandulis globosis sessilibus albidis ornatis ca. 3(–4.5) cm. longis et 1.5(–3) cm. latis; petiolo 2–10 mm. longo tomentello; corymbis multis convexis subdensis saepe paniculatim dispositis; pedicellis filiformibus ad 5 mm. longis; capitulis ca. 23-floris 9–10 mm. longis 6 mm. diametro; involucri subcylindrici squamis ca. 20 obtusis albidis viridi-striatis ciliolatis, extimis ovatis ca. 2 mm. longis et 1.3 mm. latis, intermediis oblongis ca. 5 mm. longis et 1.5 mm. latis, intimis oblanceolato-linearibus ca. 7 mm. longis et 1 mm. latis; corollis albis vel purpurascentibus a basi ad limbum gradatim ampliatis non in tubum et fauces distinctas divisis ca. 4 mm. longis; dentibus limbi patenter recurvatis deltoideis ca. 0.4 mm. longis; achaeniis gracilibus ca. 4 mm. longis deorsum decrescentibus in angulis minute scabratis aliter glabris; pappi setis ca. 35 tenuiter capillaribus vix scabratis albis.—VENEZUELA: erect bush

with white or purplish flowers, Loma de Morón, vicinity of Valera, State of Trujillo, Nov. 17, 1922, *Prof. H. Pittier*, no. 10,719 (TYPE, Gr., ISOTYPES, Par., etc.); also as a shrubby trailing less branched and larger leaved white-flowered plant in forest at Dividive, State of Trujillo, no. 10,824 (Gr., Par., etc.). Locally called *estoraque* and *pesebrito* and used as floral decoration. This species in many respects rather closely simulates forms of the widely distributed and variable *E. odoratum* L. but is readily distinguishable by the dense (meal-like) granulation on the lower leaf-surface.

E. FLAVISETUM Robinson, Proc. Am. Acad. liv. 244, 341, 342 (1918). This species was founded upon a specimen in the herbarium of the Royal Gardens at Kew, which bore a label reading "No. 520. Funcke. Coll. 1842–3. Venezuela, &c." The writer, however, has subsequently been able to find in the herbarium of the University of Geneva a second sheet of the plant. Its label fortunately bears more complete data, showing that the plant was not collected in Venezuela but on the Sierra Nevada in the Colombian province of Santa Marta. It is therefore evident that the species should be deleted from the known flora of Venezuela and added to that of Colombia. It belongs to a rather closely related group of paramo shrubs of § *Eximbricata* and was distinguished in part and certainly named from the fact that the branchlets and leaf-costa were plentifully beset with longish slender-attenuate widely spreading brownish-yellow bristles. However, a plant has now been discovered which, though corresponding closely in all other characters, lacks these bristles and bears in their place only a much shorter rather soft, often incurved and slightly viscid pubescence. It has been carefully compared with the neighboring species of this perplexing little group and is found to correspond with none of them. It seems best, therefore, to place it, at least for the present, in *E. flavisetum*, which accordingly may be provided with the following varieties.

Var. **typicum**, ramulis et costa foliorum (in facie inferiori) conspicue cum setis longiusculis brunneo-flavis patentibus attenuatis ornatis.—*E. flavisetum* Robinson, l. c.—COLOMBIA: Dept. Magdalena: Prov. Santa Marta: Sierra Nevada, *N. Funck*, no. 520 (K., BM., Univ. Gen., phot. and fragm. Gr.).

Var. **asetosum**, var. nov., ramulis et costa foliorum asetosis sed breviter molliterque pubescentibus.—COLOMBIA: Dept. Santander: shrub, 2.4–3 m. high, in woods, alt. 3300–3600 m., western slope of Páramo Rico, Jan. 15–19, 1927, *Killip & Smith*, no. 17,769 (Gr.).

E. (§ Subimbricata) Herrerae, spec. nov., herbaceum perenne vel fruticosum aspectu glabrum sed obsolete granulatum vel puberu-

lum plus minusve glutinosum; caule subhexagonali medulloso usque ad 8–10 mm. diametro; internodiis 1–9 cm. longis; ramis patenter adscendentibus; foliis oppositis breviter petiolatis oblongo-lanceolatis attenuatis argute serrato-dentatis basi cuneatis et integris concoloribus utrinque laete viridibus subglabris a basi penniveniis 6–14 cm. longis 2–5 cm. latis dense puncticulatis, venulis utrinque immersis; petiolo ca. 5 mm. longo crassiusculo angustissime marginato; corymbis densis fastigiatim ramosissimis multicapitulatis rotundatis folia suprema vix superantibus minute pulverulentis; capitulis 4–6-floris ca. 1 cm. longis subsessilibus vel arcte sessilibus binis vel trinis ad apices inflorescentiae ramulorum gracilium flexuosorum dispositis; involucri squamis ca. 8 multo inaequalibus brevissime ciliolatis dorso apicem versus saepe cum glandulis globosis minutis instructis et plus minusve vernicosis, extimis deltoideo-lanceolatis acutis 2.5 mm. longis, intimis lineari-oblongis obtusiusculis ca. 5 mm. longis; corollis ca. 6 mm. longis tubulatis leviter sursum ampliatis sine faucibus distinctis; achaeniis maturitate fusco-brunneis lucidulis argute angulatis deorsum attenuatis minute glandulari-atomiferis ca. 2.6–3 mm. longis; pappi setis ca. 30 inaequalibus flavescenti-albis vix scabratis.—PERU: Dept. Cuzco: Urubamba Valley, alt. 3000 m., Aug. 1927, *Prof. F. L. Herrera*, no. 1593 (TYPE, in Gray Herb.). To this species may also be referred several specimens, probably all from the Department of Cuzco, 1839–40, *Claude Gay* (Par., phot. and fragm. Gr.).

Among the species previously described this approaches in habit *E. drepanoides* Robinson, which however has more slender and relatively longer petioles, distinctly 3-nerved leaves and a much longer somewhat arachnoid ciliation of its phyllaries. *E. Herrerae* also approaches *E. coelocaule* Robinson, but that has a terete hollow stem, longer and more slender petioles, somewhat differently disposed leaf-veins and more prominulent veinlets.

It is a pleasure to dedicate this species to Professor Herrera, who by intensive exploration and scholarly publication has done much to further knowledge of the flora of the Peruvian Andes.

E. (§ Subimbricata) heteroneurum (Ernst), comb. nov. In a preliminary recension of the Venezuelan Eupatoriums (Proc. Am. Acad. liv. 339) prepared some ten years ago, doubt was expressed as to the precise identity of *Critonia heteroneura* Ernst, Flora, lvii. 210 (1874). As no authentic material had been available for examination and as the species appeared from description to agree in its more essential characters with the variable and widely distributed *Eupatorium morifolium* Mill. (also known to occur in northern

Venezuela), it was provisionally referred to that species. The subsequent opportunity to examine authentic material of Dr. Ernst's plant and to study what is certainly conspecific material from Colombia shows that it differs from *E. morifolium* in having smaller only 4–5-flowered closely sessile heads instead of 8–16-flowered perceptibly pedicellate heads, and also in having more decidedly angulate branches and somewhat thinner, brighter green, and more finely pellucid-punctate leaves. It thus becomes possible to recognize it as a distinct species. Happily Dr. Ernst's specific name, not having been otherwise applied in *Eupatorium*, may be retained in the new generic position. The material recently received is as follows: COLOMBIA: Dept. Santander: shrub 2.4–3 m., in edge of forest, Rio Suratá valley, above Suratá, alt. 2000–2300 m., Jan. 5–6, 1927, *Killip & Smith*, no. 16,691 (Gr.). Dept. Norte de Santander: tree 5–6 m. high, in woods along stream, Loso and vicinity (north of Toledo), alt. 2200–2400 m., *Killip & Smith*, no. 20,435 (Gr.). These new stations not only add another *Eupatorium* to the flora of Colombia but extend the known range of this species westward from the region of Caracas.

E. (§ CONOCLINIUM) HUMILE (Benth.) Hieron. Beih. Bot. Centralbl. xiii. 68 (1902); Robinson, Contrib. Gray Herb. lxxvii. 19 (1926). Hitherto this rare and little known species has been collected only on the mountains near Bogotá, first by Hartweg and much later by the Princess Therese of Bavaria. Its range may now be extended to Dept. Santander and Dept. Norte de Santander and furthermore three color-forms may be indicated as follows:

Forma a. **typicum**, corollae limbo et styli ramis albis.—*Conoclinium humile* Benth. Pl. Hartw. 199 (1845), so far as can be judged from examination of isotype in herb. N. Y. Bot. Gard.—COLOMBIA: Cordillera de los Andes, near Bogotá, *Hartweg*, no. 1102 (K., N. Y.). Dept. Santander: Páramo de las Puentes, above la Baja, alt. 3500–3700 m., Jan. 25, 1927, *Killip & Smith*, no. 18,233 (Gr.).

Forma b. **caeruleum**, forma nova, corollae limbo et styli ramis pulchre coloratis caeruleis; aliter formae typicae simillimum.—COLOMBIA: Dept. Santander: Páramo de las Puentes, above la Baja, alt. 3500–3700 m., Jan. 25, 1927, *Killip & Smith*, no. 18,190 (Gr.). Dept. Norte de Santander: Páramo de Romeral, alt. 3800–4200 m., Jan. 29–30, 1927, *Killip & Smith*, nos. 18,564 (TYPE, in Gray Herb.), 18,664 (Gr.).

Forma c. **erubescens**, forma nova, corollae limbo et styli ramis pallide roseis.—COLOMBIA: Dept. Norte de Santander: between Mutiscua and Pamplona, alt. 3400 m., Feb. 23, 1927, *Killip & Smith*, no. 19,731 (Gr.).

E. (§ Cylindrocephala) ivaefolium L. Syst. ed. 10, 1205 (1759), as *iuaefolium*. To this species, though with some doubt, the writer would refer an extraordinary plant collected in northern Argentina by Mr. Pedro Jörgensen. In it the involucre, instead of being subcylindric and 4–5-seriate, becomes in most of the heads elongate-turbinate and very attenuate at the base, the phyllaries being greatly increased in number and, as they extend down the pedicels, gradually reduced in size. This very striking departure from normal *E. ivaefolium* would certainly justify specific separation were it certain that it did not arise from some teratological modification. The latter seems probable for two reasons. In the first place, except for the downward prolongation of the involucre, the plant corresponds in all particulars to southern forms of the widely distributed and somewhat variable *E. ivaefolium*, and in the second place the involucres on Mr. Jörgensen's plant (of which several specimens in different herbaria have been examined) are not uniform. A few of them are subcylindric and about 5-seriate as in the typical *E. ivaefolium*, while the others are greatly altered even on the same individual. This variability on the same plant renders the involucral character here of doubtful value and makes it probable that it is due to some teratological influence. However, the form is so striking that it is bound to be separated to a certain extent from the typical form of the species. It may accordingly be given status as follows:

Var. **perturbinatum**, var. nov., involucri (capitulorum plerorumque) deorsum attenuati perturbinati usque ad 13 mm. longi squamis multiseriatim imbricatis.—Argentina: Formosa: Guayalec, *Jörgensen*, no. 3351 (Gr.).

E. (§ Subimbricata) jaraguense, spec. nov., fruticosum 6-12 dm. altum; caulibus erectis subteretibus purpureo-brunneis albomedullosis apicem versus ramosis; pubescentia duplici e pilis aliis densis rectis brevissimis patentibus glandulari-capitatis aliis sparsis multo longioribus attenuatis curvatis eglandusis; internodiis plerisque 1–4 cm. longis; foliis alternis subsessilibus vel breviter petiolatis rhombeo-ovatis acutis basi cuneata excepta argute serratis 4–6 cm. longis 1–2.5 cm. latis membranaceis utrinque breviter pubescentibus subtus paullo pallidioribus supra basin subtrinervatis; corymbis terminalibus sublaxis compositis basi foliaceo-bracteatis; pedicellis saepe 2–3 cm. longis adscendentibus rectis; capitulis ca. 45-floris 14 mm. altis 11 mm. diametro; involucri campanulati squamis lanceolatis valde inaequalibus ca. 4–5-seriatim imbricatis acutis atropurpureis dorso-puberulis; receptaculo plano; corollis purpureis ca. 6–7 mm. longis glabris sine faucibus distinctis; dentibus limbi parvis patentibus;

achaeniis nigris 5 mm. longis praecipue in angulis hispidulis; pappi setis ca. 25 sublaevibus corollam subaequantibus.—BRAZIL: São Paulo: grassy summit of the peak of Jaragua, near Taipas, Feb. 19, 1922, *Prof. & Mrs. E. W. D. Holway*, no. 1574 (TYPE, in Herb. Univ. Minn., phot. and fragm. Gr.).

This species may well be placed near *E. Vauthierianum* DC., which it resembles in many of its traits, but from which it differs conspicuously in its alternate, shorter, and less clearly petiolate leaves, as well as in its somewhat more firm and less scarious phyllaries.

E. (§ Cylindrocephala) lebrijense, spec. nov., fruticosum 1.2–2.1 m. altum; ramis juventate hexagonis brevissime sordideque incurvo-puberulis maturitate subteretibus leviter costulatis glabratis; foliis oppositis petiolatis rhombeo-ovatis acuminatis grosse crenato-serratis basi acutis in petiolum decurrentibus utrinque glabris viridibus paullo supra basin 3-nervatis pellucido-stictis et -lineolatis firmiter membranaceis usque ad 12 cm. longis et 6 cm. latis; petiolo 2–3 cm. longo; panicula (juvenili) late subpyramidato-convexis 10 cm. alta et 16 cm. crassa; capitulis 15–20-floris 8 mm. longis ad apices ramulorum paniculae glomeratis subsessilibus; involucri squamis 4–5-seriatim imbricatis albidis vel fuscescentibus oblongis ciliolatis apice rotundatis 3–5-viridi-nervatis; corollis pallide violaceis gracilibus 3.5–4 mm. longis paullo sursum ampliatis; dentibus limbi brevissimis; achaeniis 2 mm. longis nigrescentibus (angulis pallidis) sublaevibus; pappi setis 30–35 albis laevibus lucidulis corollam aequantibus.—COLOMBIA: Dept. Santander: rocky hillside, valley of the upper Rio Lebrija, northwest of Bucaramanga, alt. 400–700 m., Dec. 29, 1926, *Killip & Smith*, no. 16,322 (TYPE, in Gray Herb.).

In some respects this plant is close to *E. leucolithogenum*, described below, but has subsessile instead of long-pedicelled heads. Furthermore, its leaves are acute at base and in transmitted light are distinctly though somewhat irregularly marked with a dot-and-dash punctation. Like *E. leucolithogenum* it presents a transition between § *Cylindrocephala* and § *Subimbricata*.

E. (§ CYLINDROCEPHALA) LEPTOCEPHALUM DC. Prod. v. 148 (1836). This species varies much in the amount of its pubescence. The differences in this respect are sufficiently conspicuous to warrant the following recognition:

Var. α. **typicum**, glabriusculum; foliis subtus glabris vel sparse breviterque pubentibus crebre conspicueque puncticulatis.—*E. leptocephalum* DC. l. c.—Colombia to Peru.

Var. β. **hypomalacum**, var. nov., foliis subtus griseo-tomentellis, puncticulatione omnino obscurata.—*E. leptocephalum* Sch.-Bip.

Bull. Soc. Bot. Fr. xii. 81 (1865), & Linnaea, xxxiv. 535 (1865–66), not exactly DC.—PERU: Urubamba Valley at Cedrobamba, 2200 m., Aug. 1927, *Prof. F. L. Herrera*, no. 1572 (TYPE, in Gray Herb.). BOLIVIA: Prov. Larecaja: in woods, Queliguaya, vicinity of Sorata, in temperate region, alt. 2700 m., Sept. 1858, *Mandon*, no. 247 (Univ. Gen., Bot. Gard. Gen., Par., small fragm. Gr.).

E. (§ Cylindrocephala) leucolithogenum, spec. nov., fruticosum 6–9 dm. altum; caule succulento tereti fusco-viridi glabro albo-medulloso; ramis recurvantibus usque ad 2 m. vel ultra longitudine; foliis oppositis graciliter petiolatis ovatis acutis subremote mucronulato-denticulatis vel serrulatis vel leviter sinuato-dentatis subpinnatim 3–5-nervatis prope basin utrinque glabris viridibus membranaceis opacis vel subpellucide venulosis usque ad 15 cm. longis et 10 cm. latis; petiolo 2.5–3.3 cm. longo; panicula terminali pyramidata 2 dm. alta et crassa; pedicellis oppositis usque ad 1.5 cm. longis paucibracteolatis incurvo-puberulis; capitulis racemose dispositis ca. 18-floris 1 cm. longis; involucri squamis ca. 24 ca. 5-seriatim imbricatis apicem versus angustatis sed obtusis ciliolatis albis sed conspicue viridi-trinervatis; corollis viridi-albis cum limbo roseo graciliter tubulatis vix sursum ampliatis sine faucibus distinctis; limbi dentibus 5 anguste deltoideis ca. 0.3 mm. longis; styli ramis filiformibus; achaeniis immaturis 2.5 mm. longis glabris; pappi setis ca. 35 albis laevibus.—COLOMBIA: Dept. Santander: in dense woods on the western slope of Mount Peña Blanca, near Charta, alt. 2500–2600 m., Feb. 11, 1927, *Killip & Smith*, no. 19,281 (TYPE, in Gray Herb.); also Rio Suratá Valley above Suratá, alt. 2000–2300 m., Jan. 5–6, 1927, *Killip & Smith*, no. 16,657 (Gr.).

In some respects this species approaches *E. chrysostictum* Robinson and *E. diaphanophlebium* Robinson, but it differs from both in its much looser involucre, which, though multiseriate, exhibits in its open character some transition to § *Subimbricata*, also in the lanceolate-oblong phyllaries, much more hairy pedicels, more racemosely disposed heads, and larger thinner leaves.

E. (§ Subimbricata) mutiscuense, spec. nov., fruticosum 3–4 m. altum; ramis teretibus juventate dense patenterque setoso-tomentosis tardius subglabratis post exsiccationem plus minusve costato-angulatis; internodiis plerisque 1.5–2 cm. longis; pilis sordidis attenuatis articulatis; foliis oppositis breviter petiolatis oblongis acutis argute serrato-dentatis basi abrupte contractis vel subacutis textura membranaceis penniveniis supra viridibus sparse pilosis planiusculis glandulari-atomiferis subtus paullo pallidioribus in costa sordide setoso-villosis tenuiter prominulenterque reticulato-

venulosis 6–8.5 cm. longis 2–4 cm. latis; petiolo dense sordideque setoso-piloso 5–13 mm. longo; corymbis terminalibus densis multicapitulatis convexis 7–10 cm. diametro plus minusve viscosis; pedicellis plerisque 2–4 mm. longis gracilibus; capitulis 5-floris ca. 8 mm. longis; involucri squamis ca. 10 valde inaequalibus, extimis lanceolatis acutis, interioribus lineari-oblongis obtusis ciliatis medio striatonervatis purpureo-brunnescentibus margine tenuioribus pallidis; corollis glabris; tubo proprio ca. 1.5 mm. longo; faucibus cylindratis ca. 3.5 mm. longis albis; dentibus limbi purpureis; styli ramis albis; achaeniis (juvenilibus) 3 mm. longis; pappi setis ca. 35 inaequalibus, longioribus corollam subaequantibus.—COLOMBIA: Dept. Norte de Santander: edge of woods between Mutiscua and Pamplona, alt. 3400 m., Feb. 23, 1927, *Killip & Smith*, no. 19,739 (TYPE, in Gray Herb.). Also the same as a lower shrub (3–9 dm. high), Páramo de Romeral, alt. 3800–4200 m., Jan. 30, 1927, *Killip & Smith*, no. 18,655 (Gr.). A species which in many respects approaches *E. baccharoides* HBK. and *E. arbutifolium* Benth. but differs from both in the contour, toothing and membranaceous texture of the leaves, the copious indument of its branches, and in its slightly fewer-flowered heads.

E. NERIIFOLIUM Robinson, Contrib. Gray Herb. lxv. 49 (1922). The range of this species, hitherto known only from northern Venezuela, may now be extended on the basis of the following collection: COLOMBIA: Dept. Norte de Santander: on open hillside between Pamplona and La Isla, alt. 2000–2500 m., *Killip & Smith*, no. 19,799 (Gr.). The Colombian material corresponds well in all important details with the Venezuelan, but its leaves tend to be larger, becoming in some cases as much as 14.5 cm. long and 4.5 cm. wide. The flowers are reported as being greenish white. It should be mentioned that the occurrence of this broad-leaved form of *E. neriifolium* tends to reduce the differences by which the later *E. leucomyelum* Robinson of western Venezuela was separated from this species. However, *E. leucomyelum* differed not merely in the size of its leaves but in several other respects, since it has a somewhat flatter and denser inflorescence and essentially sessile leaves, the blade being decurrent (at least narrowly so) on the petioliform base almost or quite to the stem, which is not the case in *E. neriifolium*.

E. (§ CYLINDROCEPHALA) ORBIGNYANUM Klatt, Abh. naturf. Gesell. z. Halle, xv. 324 (1882). This species has thus far been a problem. It was described from material collected by d'Orbigny in Corrientes and has been variously interpreted by Hieronymus, Chodat, Hassler and others. Last summer the writer found in the

herbarium at the Botanic Garden of Geneva an unnamed isotype of the species and was permitted most kindly to borrow it for more detailed study in Cambridge. When carefully examined and compared it was found to be precisely the plant later described from Paraguay by Morong as *E. densiflorum*. This identity is from geographic considerations by no means surprising. Furthermore, Morong's description mentions no character inconsistent with the earlier diagnosis of Klatt except in stating that the heads are about 20-flowered instead of 12-flowered as described by Klatt. However, dissection of a head from d'Orbigny's Corrientes material showed it to have precisely 20 florets and indeed the number of florets in the head of a *Eupatorium* is in general subject to considerable fluctuation even upon the same individual. Hassler in Fedde, Rep. Spec. Nov. xiv. 281 (1916) reduces *E. densiflorum* Morong and several other species to varieties of *E. oxylepis* DC., but this seems unwarranted by any conclusive intergradation between the Paraguayan plant with lanceolate to lance-linear acute, obscurely puberulent to subglabrous leaves and shorter heads with blunter phyllaries, on the one hand, and the Brazilian plant with ovate-elliptic very obtuse, shorter, and commonly velvety leaves, as well as longer heads and sharper phyllaries, on the other. Dr. Hassler, however, calls attention to a smooth or nearly smooth form of the Paraguayan plant. This smoother plant under the new interpretation of specific identities may be called: **E. Orbignyanum** forma **glabratum** (Hassl.), comb. nov. (*E. oxylepis* var. *densiflorum* forma *glabratum* Hassl. l. c.).

E. (§ Conoclinium) ornatilobum, spec. nov., herbaceum perenne humile 8–23 cm. altum; caulibus 1–6 vel suberectis vel conspicue decumbentibus gracilibus subteretibus glandulari-puberulis vel rarius villosulis infra foliosissimis supra nudiusculis; foliis oppositis (supremis paucis saepe alternis) in axillis saepe proliferis vel lanceolatis et crenatis vel rhombeo-ovatis et profunde crenato-lobatis utroque acutis supra strigillosis vel sparse breviterque hirtellis subtus glabriusculis vel inconspicue hirtellis vel praecipue in nervis pilosis 9–22 mm. longis 3–14 mm. latis; crenaturis vel lobis saepissime utroque latere 2(–4); petiolo plerumque 2–7 mm. longo; corymbis terminalibus valde convexis vel etiam subglobosis 2–3(–5) cm. diametro; pedicellis filiformibus plerumque 5–10 mm. longis; capitulis ca. 30-floris 6–7 mm. longis 6 mm. diametro; involucri subturbinato-campanulati squamis lanceolatis acutis glabris 3–4-seriatim imbricatis; corollis tubulatis paullo sursum ampliatis 3 mm. longis; faucibus plerumque vix distinctis; tubo albo vel viridi-albo glabro; lobis 5 deltoideis lavandulaceis vel roseis dorso ornatissime pappilloso-puberulis ca.

0.4 mm. longis; styli ramis clavatis corollae limbo similiter coloratis; achaeniis nigris glabris deorsum decrescentibus 1.8–2 mm. longis; pappi setis ca. 25 albis corollam aequantibus.—COLOMBIA: Dept. Santander: edge of Páramo de las Vegas, alt. 3300–3700 m., Dec. 20–21, 1926, *Killip & Smith*, nos. 15,687 (TYPE, in Gray Herb.), 15,744 (Gr.); Páramo de Mogotocoro, near Vetas, alt. 3700–3800 m., Jan. 18, 1927, *Killip & Smith*, no. 17,606 (Gr.); western slope of Páramo Rico, alt. 3300–3600 m., Jan. 15–19, 1927, *Killip & Smith*, nos. 17,720 (Gr.), 17,740 (Gr.). Colombia without locality: *Purdie* (K.).

This species, being one of several rather similar paramo types of § *Conoclinium*, seems most nearly related to *E. humile* (Benth.) Hieron., which, however, has oval or elliptic, merely crenate and not lobed leaves, obtuse or rounded at each end, and much more coarsely hairy. There are also other differences. For instance *E. ornatilobum* tends to be more leafy-stemmed and to be somewhat nigrescent in drying.

E. (§ Cylindrocephala) perglabrum, spec. nov., fruticosum vel arborescens glabrum 1–5 m. altum; ramis primo angulatis tardius subteretibus foliosis; internodiis plerisque 1–3.5 cm. longis; foliis oppositis breviter petiolatis lanceolatis utroque attenuatis vel acuminatis utroque latere crenato-serrulatis apice basique integris utrinque viridibus glabris impunctatis supra basin 3-nervatis minute pellucideque reticulato-venulosis 5–10 cm. longis 12–28 mm. latis; petiolo 7–14 mm. longo; corymbo convexo composito 7–14 cm. diametro basin versus foliato-bracteato multicapitulato; ramis ramulisque angulatis et saepe compressis; capitulis 5-floris ca. 12 mm. longis 3–4 mm. crassis in glomerulos 3–5-capitulatos arcte sessilibus; involucri squamis 14 ca. 4-seriatim imbricatis valde inaequalibus pallide viridibus saepe purpureo-marginatis dorso glabris plerumque 3-nervatis; corollis viridescente vel rubescente albis a basi ad limbum paullo gradatimque ampliatis 5 mm. longis sine faucibus distinctis; dentibus limbi 5 deltoideis 0.5 mm. longis; antheris apice distincte appendiculatis; achaeniis gracilibus 4.5 mm. longis in angulis paullo scabrato-hirtellis; pappi setis ca. 30 ca. 4 mm. longis albis sublaevibus. —COLOMBIA: Dept. Santander: edge of woods, Rio Suratá valley, above Suratá, alt. 2000–2300 m., Jan. 5–6, 1927, *Killip & Smith*, no. 16,550 (TYPE, in Gray Herb.); open hillside, vicinity of California, alt. 3000 m., Jan. 11–27, 1927, *Killip & Smith*, no. 16,929 (Gr.); thickets, vicinity of Charta, alt. 2000–2600 m., *Killip & Smith*, nos. 18,861 (Gr.); 18,918 (Gr.) and 19,237 (Gr.).

A neat and very smooth shrubby or arborescent species with copious bright green foliage and ample corymbs of slender sessile

heads, apparently frequent in Santander, but not yet seen from elsewhere. In many respects *E. perglabrum* is similar to *E. leptocephalum* DC. but differs in its completely glabrous, much more strongly costate-angulate branchlets and pedicels, and also in its more finely and continuously crenate-serrulate (instead of rather sharply and remotely toothed) impunctate leaves.

E. (§ SUBIMBRICATA) STEETZII Robinson, Proc. Am. Acad. lv. 36 (1919). This species has been known thus far only from northern Venezuela about Caracas and Colonia Tovar. However, in the rich Colombian collection recently made by Messrs. Killip & Smith there is a plant which appears at once conspecific and varietally distinguishable from the Venezuelan form, the differential traits being as follows:

Var. α. **typicum**, foliis basi rotundatis; involucri squamis ciliatis sed margine excepta vix pubescentibus.—Northern Venezuela as stated.

Var. β. **columbiense**, var. nov., foliis basi acutiusculis vel acutis vel etiam breviter acuminatis; involucri squamis non solum copiose ciliatis sed etiam saltim apicem versus dorso villoso-hirtellis.—COLOMBIA: Dept. Santander: vicinity of Las Vegas, alt. 2600–3000 m., Dec. 21–23, 1926, *Killip & Smith*, no. 15,933 (TYPE, in Gray Herb.).

E. (§ CONOCLINIUM) STOECHADIFOLIUM L. f., Suppl. 355 (1781); J. E. Sm. Ic. iii. t. 69 (1791); Robinson, Proc. Am. Acad. liv. 324 (1918). The material of this species collected by Messrs. Killip & Smith falls into two well marked varieties, as follows:

Var. α. **typicum**, foliis oblongis plerumque obtusis crebre crenulatis conspicue discoloribus supra viridibus plus minusve griseo-lanulatis subtus albo-lanatis; involucro basin versus albo-lanato.—Type collected by Mutis (herb. Linn. Soc., phot. Gr.). This variety was collected by Messrs Killip & Smith at various points in Dept. Santander, nos. 16,883, 17,243, 18,184, and 18,717 (all in Gr.).

Var. β. **pamplonense**, var. nov., foliis oblongo-lanceolatis plerumque acutis integerrimis vel paullo undulatis margine subrevolutis multo minus bicoloribus quam apud var. *typicum* supra subglabratis viridibus subtus obscure viridibus maturitate vix griseo-lanulatis; involucro viridi basin versus arachnoideo-hirto.—COLOMBIA: Dept. Norte de Santander: open hillside between Pamplona and La Isla, alt. 2000–2500 m., Feb. 27, 1927, *Killip & Smith*, no. 19,795 (TYPE, in Gray Herb.).

E. (§ Cylindrocephala) suratense, spec. nov., fruticosum 1.8–2.4 m. altum; caule basin versus usque ad 1.2 cm. diametro apicem

versus (post exsiccationem) glanduloso-hirtello viridi flexuoso; ramis curvato-adscendentibus; foliis oppositis breviter petiolatis lanceolato-ovatis acuminatis breviter remoteque serrulatis vel integriusculis basi acutis a basi 3-nervatis utrinque laete viridibus supra in nervis hirtellis subtus in nervis venisque tenuiter patenterque pilosis et in superficie fusco-punctatis usque ad 10 cm. longis et 3 cm. latis membranaceis; petiolo gracili patenter glandulari-hirto ca. 1 cm. longo; corymbis terminalibus amplis compositis usque ad 3 dm. diametro foliaceo-bracteatis; ramulis inflorescentiae ultimis plerisque 1–5 cm. longis nudis gracilibus glandulari-hirtellis apice 3(–5)-capitulatis; capitulis ca. 12-floris 11.5 mm. longis 5 mm. diametro plerisque sessilibus vel subsessilibus ternis vel spicatim quinis dispositis; involucri squamis ca. 20 ca. 4–5-seriatim imbricatis albidis (1–)3-viridi-nervatis apicem rotundatum versus viridibus hirtellis margine eroso-ciliolatis; corollis albis; tubo paullo sursum ampliato glabro 5 mm. longo; dentibus limbi 5 deltoideis 0.5 mm. longis; achaeniis 4 mm. longis gracilibus in angulis minute scabratis; pappi setis ca. 40 albis sublaevibus.—COLOMBIA: Dept. Santander: valley of the Rio Suratá above Suratá, alt. 2000–2300 m., Jan. 5–6, 1927, *Killip & Smith*, no. 16,533 (TYPE, in Gray Herb.). A highly characteristic species of neat appearance, in habit somewhat resembling *E. perglabrum* described above, but with pubescent foliage and larger more numerously flowered heads, which are sometimes spicately disposed at the ends of the branches in the much more open corymbiform inflorescence.

There may be associated with *E. suratense* somewhat doubtfully a shade variety, the distinctions between it and the typical variety being as follows:

Var. α. **typicum**, foliis lanceolato-ovatis flavido-viridibus subtus fusco-punctatis; ramulis pedicellisque patenter pilosulis; capitulis plerisque ad apices ramulorum inflorescentiae ternis vel quinis; corollae limbo pallide roseo.—Hab. and excicc. as above cited.

Var. β. **aphanostictum**, var. nov., foliis ovatis viridibus subtus epunctatis; ramulis pedicellisque obscure sparseque incurvo-hirtellis; capitulis plerisque ad apices ramulorum inflorescentiae solitariis rarius binis vel trinis; corollae limbo albo.—COLOMBIA: Dept. Santander: thickets along river, vicinity of Suratá, alt. about 1700 m., Jan. 4–10, 1927, *Killip & Smith*, no. 16,468 (Gr.).

E. (§ Cylindrocephala) Thurnii, spec. nov., fruticosum ut videtur erectum scabrido-puberulum subrigidum; caule subtereti fusco-brunneo 5 mm. diametro medulloso dense breviterque puberulo et atomifero; internodiis usque ad 5 cm. longis; foliis oppositis breviter

petiolatis vel saepe subsessilibus lanceolatis integris vel undulato-crenatis acutis basi cuneatis a basi 3-nervatis supra lucidulis aliquid bullatis et rugosis in nervis venisque brunnescenti-hirtellis aliter glabris subtus vix pallidioribus prominulenter reticulatis breviter brunnescenti-pubescentibus plerisque 4–6 cm. longis 1–2 cm. latis textura firmis crassis rigidiusculis; panicula subcylindrica usque ad 4 dm. longa et 13 cm. crassa; ramis paniculae oppositis foliaceo-bracteatis curvato-adscendentibus ad apicem corymbiferis; corymbis valde convexis vel planiusculis ca. 4–6 cm. diametro plerisque 6–20-capitulatis densiusculis; pedicellis plerisque 3–8 mm. longis; capitulis ca. 25-floris maturitate 15 mm. longis et 7 mm. diametro; involucri squamis ca. 30 multiseriatim imbricatis pallidis arcte appressis textura firmis apice rotundis dorso flavescenti-brunnescentibus sub-lucidis 3-nervatis, extimis late ovatis 2.5 mm. longis et 1.5 mm. latis, intermediis elliptico-ovatis vel oblongis 3–5 mm. longis usque ad 2.5 mm. latis, intimis paucis angustissimis 9 mm. longis vix 0.7 mm. latis acutiusculis 1-nervatis; corollis subglabris sparse atomiferis caerulescenti-albis, tubo proprio et faucibus gradatim ampliatis vix distinguendis ca. 6 mm. longis; dentibus limbi anguste deltoideis 0.7 mm. longis; achaeniis gracilibus (angulis paullo scabratis exceptis) glabris (immaturis) ca. 4 mm. longis; pappi setis ca. 45 tenuiter capillaribus sublaevibus albidis ca. 6 mm. longis.—*E. conyzoides* var. Oliver, Trans. Linn. Soc. ser. 2, ii. 277 (1887), not Vahl.—British Guiana (?): Roraima district alt. about 1650 m., 1884, *im Thurn*, no. 95 (K.); Roraima on the lower savannah, Jan. 1910, *E. Ule*, no. 8790 (K.).

The latter specimen being the more complete of the two clearly identical ones here cited has been the one chiefly used in drawing up the character and should therefore be regarded as the type, notwithstanding the fact that the species is named for Everard F. im Thurn, the original discoverer.

Though this plant was regarded by Oliver as a possible variety of *E. conyzoides* Vahl (i. e. *E. odoratum* L.) it clearly differs in many respects from that widely distributed and variable species. Its heads are somewhat larger, its phyllaries of firmer texture, its leaves are subsessile or much more shortly and stoutly petioled, more rugose and of a somewhat rigid texture, its stem instead of being light in color and sparingly to copiously pubescent is dark brown and densely puberulent. There seems no escape from the conclusion that it constitutes a distinct and endemic species of this highly peculiar region. As the Roraima district is a rather vaguely delimited area near the boundary between British Guiana and both Brazil and

Venezuela it is by no means certain which of these countries included the station or stations at which im Thurn and Ule collected this plant.

E. (§ Subimbricata) Vargasianum DC. Prod. v. 155 (1836); Robinson, Proc. Am. Acad. lv. 39 (1919). This species, though reported as occurring in Colombia by Klatt in Engl. Bot. Jahrb. viii. 36 (1887) and by Heer, Mém. Soc. neuchât, Sci. Nat. v. 420 (1913), has heretofore been known to the writer only from Venezuela, where collected originally by Vargas (Conserv. Gen.) near Caracas and subsequently at Sanchorquiz by Eggers, no. 13,413 (Gr.) and at San Pablo de Mendoza, State of Trujillo, by Pittier, no. 10,745 (Gr.). There seemed grounds for doubting the reports from Colombia and it has lately been possible to examine in the herbarium of the British Museum a specimen of Lehmann's no. 938 from the Central Cordillera of Popayan, the number upon which Klatt based his record. The specimen at the British Museum proved to be unquestionably *E. Stuebelii* Hieron. Concerning the identity of the plant determined by Heer as *E. Vargasianum* no information can be given, since it has not been found in any of the several large herbaria recently visited by the writer. However, it is now possible to record the true *E. Vargasianum* from Colombia as follows: Dept. Norte de Santander: in thicket between Chinácota and La Esmeralda, alt. 1000–1300 m., Mar. 19, 1927, *Killip & Smith*, no. 20,883 (Gr.). This specimen appears to be an exact match for the one collected at Sanchorquiz by Eggers. It is furthermore from a region where other Venezuelan elements have been found in the flora, which would be quite improbable about Popayan where the species was wrongly reported by Klatt.

Mikania angularis H. & B. Pl. Aequin. ii. 87, t. 106 (1809). This species was based on a plant collected near Gonzanama, Prov. Loja, Ecuador, by *Humboldt & Bonpland*, no. 3434 (Par., phot. Gr.). Thus far it is known to the writer only from this original material from southern Ecuador and from similar and as it appears conspecific material collected near the Monzon River, Dept. Huanuco, Peru, by *Weberbauer*, no. 3640 (Brl., fragm. Gr.). It is a plant which is nearly glabrous, as originally described, and has triangular-hastate leaves and white pappus. The species was long ago reported by Bentham, Bot. Sulph. 113 (1844), as having been collected by Hinds at Tumaco, Dept. Nariña, Colombia; and Baker in Mart. Fl. Bras. vi. pt. 2, 245 (1876) cites it as collected in Dutch Guiana by *Wullschlaegel* and by *Hostmann*, no. 164. On the usually excellent authority of Bentham, though without opportunity to study the plant

of Hinds, the species was included by the writer in his revision of the Mikanias of Colombia, Contrib. Gray Herb. lxiv. 33 (1922). It was similarly included, on the authority of Baker, by Pulle in his very useful Enumeration of the Vascular Plants of Surinam, 458 (1906). While at the Kew Herbarium in the summer of 1927, the writer had a chance to examine the Hinds specimen from Colombia, labelled *M. angularis* by Bentham and found it by no means this species but a characteristic specimen of *M. punctata* Klatt. On the sheet Mr. J. G. Baker had written in pencil " = Wullschlaegel 1494 Paramaribo," thus indicating its identity with the plant he was in the Flora Brasiliensis recording as *M. angularis* from Dutch Guiana. As a result of the here corrected identification of the Hinds plant, *M. angularis* H. & B. may for the present be deleted from the flora of Colombia. Similarly, although the writer has not yet been able to check either the specimen of Wullschlaegel or Hostmann's no. 164, it appears probable from Baker's annotation that they were identical with the plant of Hinds and were therefore *M. punctata* Klatt. At all events the Guiana representation of *M. angularis* must be critically re-examined if records based upon it are to be trusted, especially as this species of the Ecuadorian and Peruvian Cordilleras would appear a rather improbable element in the Guiana flora, while, on the other hand, there would be considerable likelihood that *M. punctata* Klatt, a plant long known from Mexico to Venezuela, may extend to similar habitats furnished by the Guianas.

M. ANTIOQUIENSIS Hieron. in Engl. Bot. Jahrb. xxviii. 580 (1901). When revising the Mikanias of Colombia some years ago, the author, Contrib. Gray Herb. lxiv. 35 (1922), reduced this species to the nearly related Brazilian *M. lanuginosa* DC., interpreting that species widely both as to range and variability. Material subsequently available and a re-examination of the type of *M. lanuginosa* make it seem probable that the Cordilleran plant of Venezuela, Colombia, Peru and Bolivia, though in many respects similar, may be separated with fair definiteness from the Brazilian plant, which appears to have thinner more flexible and distinctly toothed leaves with more deeply cordate base and more rounded sinus. Its leaves are more strongly bicolorous and the pubescence is less closely matted than in the Cordilleran plant. The latter has thicker firmer subentire leaves less deeply cordate, with less developed basal lobes and closer pubescence. Unless further collecting should disclose tendencies toward intergradation not evident at present, these plants would seem best treated as separate species. *M. antioquiensis* may be regarded as covering also the plant passing under the herbarium

name *M. Karsteniana* Klotzsch, a nomen subnudum, mentioned but without adequate diagnosis by Hieronymus, l. c. 581. The slight distinctions of petiole, pubescence and pappus, upon which Hieronymus relied in attempting a specific distinction between his *M. antioquiensis* and the undescribed *M. Karsteniana*, do not hold satisfactorily. To *M. antioquiensis* may be referred also a presumably Brazilian specimen, namely Ule's no. 8797, collected on his Amazonas Expedition, in the Roraima region along river banks.

M. (§ Thyrsigerae) arthroclada, spec. nov., fruticosa volubilis breviter denseque fulvo-tomentella; caulibus teretibus; internodiis 6 cm. vel ultra longis; ramis flexuosis gracilibus conspicue nodosis; internodiis ramorum plerisque 6–18 mm. longis; foliis oppositis parvis breviter petiolatis ovato-oblongis obtusis crenato-serratis basi subcuneatis integris paullo supra basin pinnatim nervatis supra cum glandulis globosis sessilibus ornatis subtus in nervis brevissime puberulis obscure puncticulatis 10–17 mm. longis 5–9 mm. latis; petiolo 2–5 mm. longo; paniculis ramos terminantibus pyramidatis 3–5 cm. altis et crassis fulvo-tomentellis; capitulis (submaturis) 3.5–4 mm. longis breviter pedicellatis; involucri squamis oblongis apice rotundatis lacerato-ciliatis dorso plus minusve fulvo-hirtellis ca. 3 mm. longis; corollis albis limbo hirtis; achaeniis (valde immaturis) nigris ca. 0.7 mm. longis; pappi setis ca. 25 albis vix scabratis.—PERU: Dept. Cuzco: above Cosnipata between the Tambos Trecruces and Tambomayo, alt. 2500–2600 m., May 7, 1912, *Prof. A. Weberbauer*, no. 6972 (TYPE, Field Mus., phot. Gr.).

Readily distinguished from other Peruvian species of this genus by its very small leaves and its very short crisp, somewhat stiff or setulose rufous indument. The leaves are early deciduous from the lower parts of the curved branches, which then show conspicuous thick nodes.

M. BADIERI DC. Prod. v. 194 (1836). This species, thus far recorded only from the Lesser Antilles and Trinidad, is much too closely approached by *M. Hookeriana* DC. (l. c. 195) of British Guiana. After an examination of the types and several subsequent collections of both of these species, it has been impossible to discover a single constant difference. It is true, the arrangement of the sessile heads at or near the tips of the panicle-branches is somewhat more spicate in its tendency in the plant of British Guiana and terminal and glomerate in the plant of the Antilles, but this trait shows such variability in both plants and even in some cases on the same individual that it forms a poor differential character. It seems probable that *M. Hookeriana* should be reduced to *M.*

Badieri, which was simultaneously published and has a slight priority of position. It is, in this connection, of interest that a specimen specifically indistinguishable from the plants here discussed has been found in a loan from the Missouri Botanical Garden bearing the following data: Tehuantepec, Oaxaca, Mexico, *C. R. Orcutt*, no. 3434. Unless some confusion of labeling has here occurred this forms a notable extension of range and adds an interesting and characteristic species to the recorded flora of Mexico.

M. Gonzalezii Robinson & Greenman, Proc. Bost. Soc. Nat. Hist. xxix. 107 (1899). This little known plant, hitherto recorded only from Vera Cruz, Mexico, may now be extended in range as follows: Colombia: Dept. Santander: vicinity of Tona, alt. 1900–2100 m., in woods, Feb. 17, 1927, *Killip & Smith*, no. 19,469 (Gr.). The species has rather closely the habit of *M. cordifolia* (L. f.) Willd. but somewhat larger heads, flattish (uncrisped) corolla-teeth, broader and blunter phyllaries, more conspicuous foliaceous bracts, less prominently angled branches and larger smoother leaves.

M. (§ Racemosae) Houstoniana (L.) Robinson, Proc. Am. Acad. xlii. 47 (1906). This species was founded on material collected by Dr. Houston in Vera Cruz, Mexico. Happily the original material is still preserved in the British Museum and there is an excellent photograph of it in the Gray Herbarium. It shows a plant with rather broadly ovate leaves, apparently of rather soft probably carneous texture, which become thin in drying and show on both surfaces only a rather obscure and loose reticulation of mostly immersed veins and veinlets. Essentially the same plant is now known from Oaxaca, Chiapas, Guatemala, British Honduras, and Costa Rica. In Costa Rica the reticulation of the leaves tends to become a little more prominent. In Colombia near Las Nubes, H. H. Smith collected a plant which it has seemed best to refer to *M. Houstoniana*, though it has somewhat more narrowly ovate leaves of slightly firmer texture. Nearly related plants of a more puzzling nature have recently been collected in the Departments of Santander and Norte de Santander, having still narrower ovate-oblong rather than ovate leaves of even firmer texture and provided both above and beneath with an exserted reticulation of somewhat double character (i. e. a finer within the areolae of a coarser). In all other respects, these plants agree rather closely with *M. Houstoniana*. It is possible that further collecting may show these plants distinct and capable of maintaining the perceptible differences which now separate them. It appears rather more probable, however, that they will be found to merge when the now scarcely known territory between their stations has been more

perfectly explored, for their distinctions are chiefly vegetative and of a kind easily bridged.

For this reason it seems best, for the present, to give them status as probable varieties of the same species, as follows:

Var. α. **typica**, foliis late ovatis vel ovato-ellipticis subcarneis; venulis immersis vel leviter prominulentibus; capitulis racemosis graciliter pedicellatis.—*M. Houstoniana* (L.) Robinson, l. c.

Var. β. **santandrensis**, var. nov., foliis angustius ovatis vel ovato-oblongis firmiusculis subcoriaceis utrinque duplice prominulenterque reticulatis; capitulis aut racemosis et graciliter pedicellatis aut subspicatis et subsessilibus.—COLOMBIA: Dept. Santander: an herbaceous vine, with pale green bracts and yellow-green pappus, on wooded banks of the Rio de la Baja, La Baja, alt. 2200–2300 m., Jan. 26, 1927, *Killip & Smith*, no. 18,290 (TYPE, Gr.); vicinity of La Baja, alt. 3000 m., Jan. 14–31, 1927, *Killip & Smith*, 18,129 (Gr.); vicinity of Las Vegas, alt. 2600–3000 m., *Killip & Smith*, no. 16,127 (Gr.). Dept. Norte de Santander: in dense woods between Pamplona and Toledo, alt. 2800–3000 m., Feb. 27–28, *Killip & Smith*, no. 19,961 (Gr.).

Of this plant two differing forms are noticeable, as follows:

Forma a. **normalis**, capitulis racemosis graciliter pedicellatis.—Distrib. and exsicc. as above stated.

Forma b. **apodocephala**, forma nov., capitulis subspicatis aut sessilibus aut brevissime pedicellatis.—COLOMBIA: Dept. Santander: woody vine in dense forest, Rio Suratá Valley, alt. 2000–2300 m., Jan. 5–6, 1927, *Killip & Smith*, no. 16,727 (Gr.).

This form with subspicate heads naturally approaches § *Spiciformes* and particularly resembles *M. leiostachya* var. *irrasa* Robinson. However, it is clearly a mere form of the variety just described and like all forms of *M. Houstoniana*, whether herbaceous or more or less lignescent, has fistulose stems, while *M. leiostachya* and its variety have stems with a solid pith and a somewhat firmer character, being much less inclined to crush and flatten in drying.

M. (§ SPICIFORMES) KILLIPII Robinson, Contrib. Gray Herb. lxxvii. 53 (1926). Hieronymus in Engl. Bot. Jahrb. xix. 48 (1894) recorded *M. psilostachya* DC. near Anserma in the Dept. El Cauca, on the basis of Lehmann's no. 7495. When revising the Mikanias of Colombia, the writer, l. c. lxiv. 30 (1922), alluded to this same number of which he had seen a single sheet in the herbarium of the New York Botanical Garden and explained that it seemed an unusually smooth form of the species and that the New York sheet bore quite different data, indicating that the plant had come not from El Cauca but

from Dept. Cundinamarca. Subsequently he has been able to examine three excellent sheets of Lehmann's no. 7495, two of them belonging to the Kew Herbarium and one recently received in exchange at the Gray Herbarium. The labels of these all agree with the data cited by Hieronymus, but the plant is clearly quite distinct from *M. psilostachya* DC. and is in fact *M. Killipii* Robinson, the type of which came also from Dept. El Cauca.

M. LINDLEYANA DC. Prod. v. 195 (1836). This species was based on a specimen from Guiana, belonging in the Lindley herbarium. In recent years the writer has examined four specimens which appear to be referable to this species and which considerably extend its recorded range. They are as follows: (1) Forest of Plantation, Spieringshoek, Surinam, *Samuels*, no. 38 (Gr.), bringing the plant into the flora of Dutch Guiana, though not listed by Pulle. (2) A portion of the material representing Fendler's no. 2348 in the Kew Herbarium (where mixed with *M. gracilipes* Robinson), labeled as from near Colonia Tovar, Venezuela. (3) Climbing high on trees in wet woods, Frijoli Station of the Panama Railroad, Feb. 6, 1862, *Sutton Hayes*, no. 490 (K., BM.). (4) A whitish-flowered plant, at Juruá Miry, Rio Juruá, Amazonas, Brazil, July, 1901, *E. Ule*, no. 5679 (K.). It seems rather remarkable that a species of fairly characteristic habit, ranging from the Guianas to Panama and northwestern Brazil, should not have been reported more frequently. Being a climber of low wet woodlands, it is probably rather difficult to reach and to collect.

M. (§ Corymbosae) lutescens, spec. nov., fruticosa volubilis; caule gracili subtereti glabro post exsiccationem flavido-brunneo; internodiis plerisque 2–8 cm. longis; ramis gracillimis subhexagonis; foliis oppositis graciliter petiolatis hastato-ovatis acutis crenato-dentatis vel -lobulatis vel trifidis basi sinu patenti cordatis a basi 5–7-nervatis tenuibus supra in nervis puberulis subtus parce setoso-villosis utrinque viridibus concoloribus 3–6 cm. longis 1.5–3 cm. latis; dentibus mucronulatis; petiolis 1–2 cm. longis, eis ejusdem jugi basi per lineam crassiusculam plus minusve setoso-ciliatam transversam conjunctis; corymbis compositis foliaceo-bracteatis; ramis inflorescentiae ultimis plerumque 3–7-capitulatis; pedicellis 1.5–3 mm. longis; bracteolis herbaceis ovatis integris ad vel versus summum pedicelli affixis; capitulis ca. 11 mm. longis; involucri squamis lineari-lanceolatis acutis ca. 8 mm. longis glabris flavescenti-viridibus basi angustatis incrassatisque; corollis lutescentibus glabris; tubo proprio 2.7 mm. longo gracili; faucibus subcylindrato-campanulatis 2.5 mm. longis; dentibus limbi lanceolatis acutis 1.8 mm. longis; achaeniis

glabris 3 mm. longis; pappi setis ca. 60 albis laevibus.—PERU: Dept. Ayacucho: Prov. Huanta: twining shrub with pale yellow flowers, in evergreen bush-wood, Choimacota Valley, alt. 2900 m., Feb. 28–Mar. 10, 1926, *Prof. A. Weberbauer*, no. 7574 (TYPE, Field Mus., ISOTYPE, Gr.). Probably related to *M. brachyphylla* Hieron., which, however, has much smaller, thicker, more densely puberulent, less toothed leaves, shorter, broader, more obtuse and more pubescent phyllaries, and many other differing features.

M. (§ Spiciformes) ochroleuca, spec. nov., volubilis gracilis ut videtur herbacea; caule tereti primo crispe minuteque puberulo tardius laeviusculo fistuloso; internodiis usque ad 16 cm. longis; foliis oppositis graciliter petiolatis deltoideo-ovatis profunde hastatis acuminatis utrinque viridibus glabris tenerrimis 7–8 cm. longis 5–6.5 cm. latis ima a basi 3(–5)-nervatis margine undulatis; lobis lateralibus acutis vel subacutis; petiolis flexuosis 3–3.5 cm. longis, eis ejusdem jugi a linea puberula vix incrassata transversa conjunctis; paniculis subdensis ovoideis terminalibus et lateralibus 7–13 cm. altis 6–10 cm. diametro puberulis, ramis paniculae subdivaricatis basi iterum ramosis; ramulis ultimis 1–2 cm. longis spiciformibus; capitulis sessilibus vel breviter pedicellatis 7 mm. longis; bracteolis parvis lanceolato-linearibus 1–1.5 mm. longis; involucri squamis viridibus oblanceolato-oblongis acutis basi paullo incrassatis subglabris 4.5–5 mm. longis; corollis albo-luteis; tubo proprio gracili glabro ca. 3 mm. longo; faucibus vix ullis; limbi dentibus oblongo-ovatis obtusis patentibus ca. 1 mm. longis; achaeniis nigris 2.2 mm. longis; pappi setis 30–40 carneis corollam aequantibus.—BRAZIL: a climbing plant with whitish-yellow flowers, Seringal S. Francisco, Rio Acre (coll. on Amazonas Exped.), July 1911, *E. Ule*, no. 9886 (K., phot. and small fragm. Gr.). In many respects similar to *M. hastifolia* Bak. (known to the writer only from the original description), but having the spiciform branches much shorter and tending to branch toward the base, the heads larger, and the achenes more than twice as long.

M. (§ Thyrsigerae) pachydictya, spec. nov., fruticosa volubilis inflorescentiis puberulis exceptis glaberrima; ramis gracilibus flexuosis subhexagonis; internodiis usque ad 12 cm. vel ultra longitudine; foliis oppositis petiolatis oblongis vel ovato-oblongis cuspidato-acuminatis integris basi rotundatis firmiter coriaceis pallide viridibus concoloribus glabris prope basin pinnatim 5-nervatis supra grosse reticulatis subtus tenuius duplicateque reticulatis 8–10 cm. longis 4–5.5 cm. latis; petiolis glabris 2 cm. longis, eis ejusdem jugi basi leviter per annulum transversum paullo incrassatum conjunctis;

panicula terminali laxa composita foliaceo-bracteata crispe sordideque hirtella; ramis ramulisque divaricatis; ramulis ultimis plerisque 3–(spicatim)5-capitulatis; capitulis 1 cm. longis sessilibus; bracteolis 1–1.5 mm. longis subulatis; involucri squamis anguste oblongis 5–5.5 mm. longis apice rotundatis ciliatis dorso brunnescentibus vix nervatis apicem versus subhirtellis aliter glabris; corollae tubo proprio gracili 1.5–2 mm. longo glandulari-atomifero; faucibus campanulato-subcylindratis ca. 2 mm. longis; dentibus limbi deltoideis 0.5 mm. longis; achaeniis gracilibus 4.5 mm. longis atrobrunneis in faciebus paullo granulato-puberulis; pappi setis ca. 40 brunnescentibus corollam aequantibus.—COLOMBIA: Dept. Norte de Santander: edge of woods, eastern slope of Páramo del Hatico between Toledo and Pamplona, alt. 2200 m., Mar. 12, 1927, *Killip & Smith*, no. 20, 564 (TYPE, in Gray Herb.).

This species in its inflorescence and some other features approaches *M. clematiflora* Rusby, but differs in having much thicker, firmer and very strongly reticulate leaves, shorter petioles, puberulent inflorescence, and somewhat smaller heads.

M. (§ Racemosae) roraimensis, spec. nov., fruticosa volubilis ubique glaberrima; caule tereti fistuloso post exsiccationem purpurascenti-brunneo costulato; internodiis 3–5 cm. longis; foliis oppositis breviter petiolatis obovatis vel oblanceolato-spatulatis breviter subacuminatis (apice vero obtuso) integerrimis basin versus attenuatis paullo supra basin trinervatis concoloribus crassiusculis subcoriaceis obsolete puncticulatis 5–6 cm. longis 1.8–2.4 cm. latis; petiolo ca. 5 mm. longo; racemis firmiusculis terminalibus et opposite in axillis superioribus dispositis pedunculatis 4–6 cm. longis; pedicellis 3–6 mm. longis patentibus vel saepissime paullo recurvatis; bracteolis linearibus pedicellos basi subtendentibus et subaequantibus; capitulis ca. 1 cm. longis nutantibus; involucri squamis anguste oblongis apice rotundatis; corollis albidis; tubo proprio gracili 1.8 mm. longo; faucibus campanulatis ca. 1 mm. altis; dentibus limbi deltoideis ca. 0.5 mm. longis; achaeniis gracilibus glabris 4 mm. longis; pappi setis 40–50 brunnescenti-albidis corollam aequantibus.—BRAZIL: in Roraima, Jan. 1910, *E. Ule*, no. 8798 (K., phot. and small fragm. Gr.). This species agrees in many points with the description of *M. Sprucei* Bak. in Mart. Fl. Bras. vi. pt. 2, 264 (1876), but Baker states that his species had the heads all sessile, with bractlets at the base of the involucre, the corolla-limb equal to the tube, the achenes only 1 line (= 2 mm.) long, the petioles 4–6 lines (= 8–12 mm.) long, and the leaves more than half again as large as those shown in the plant here described. With these very definitely stated differences it

seems highly improbable that the two plants can prove conspecific though they must have some habital similarity. *M. Sprucei* came from San Carlos on the Rio Negro, a locality in southern Venezuela, probably over 600 km. from the Roraima region where *Ule* collected the plant here in question.

M. (§ Racemosae) scabra DC. Prod. v. 190 (1836). The range of this species, thus far recorded from Brazil, Guiana, and Trinidad, as stated by Urban, Symb. Ant. v. 218 (1907), may now be extended upon the basis of the following specimens: (1) Venezuela: very high climber, near stream, Ciudad Bolivar, *L. H. & E. Z. Bailey*, no. 1356 (Gr.). (2) Panama: shrubby, climbing over shrubs and trees near the City of Panama, Aug. 1862, *Sutton Hayes*, no. 677 (K.).

M. (§ Thyrsigerae) Smithii, spec. nov., fruticosa volubilis; caule tereti costulato brunneo plus minusve villoso vel puberulo vel glabriusculo albo-medulloso; internodiis 5–15 cm. longis; foliis oppositis petiolatis ovato-oblongis vel ovatis acuminatis integris vel obsolete sparsissimeque cuspidato-denticulatis basi rotundatis pinnatim 5-nervatis utrinque viridibus supra lucidulis glaberrimis vel paullo setulosis subtus obscuris leviter duplicato-reticulatis praecipue in nervis hirtellis 5–9 cm. longis 3–4.5 cm. latis; petiolis gracilibus 1–2 cm. longis plus minusve setuloso-villosis; paniculis terminalibus ovoideis compositis foliaceo-bracteatis pubescenti-hirtellis; capitulis ca. 8 mm. longis pedicellatis; pedicellis filiformibus plerisque 3–5 mm. longis; bracteola plerumque prope apicem pedicelli gesta; involucri squamis laete viridibus anguste oblongis tenuibus subglabris apice rotundatis basi gibbosis; corollis albis vel flavidi-albis; tubo proprio gracili glabro 1.5 mm. longo; faucibus turbinati-campanulatis 1.5 mm. longis; dentibus limbi acutis ca. 1 mm. longis; achaeniis gracilibus 3 mm. longis obscure hirtellis; pappi setis ca. 30 albis vel albidis corollam subaequantibus.—Colombia: Dept. Santander: Mesa de los Santos, alt. 1500 m., Dec. 11–15, 1926, *Killip & Smith*, nos. 15,200 (type, in Gray Herb.), 15,118 (Gr.), 15,429 (Gr.). The last mentioned number shows in many places especially along the leaf-nerves, on the pedicels and phyllaries, etc., felt-like growths of the sort produced by eriophyid mites.

Traced by the author's key to the Colombian Mikanias (Contrib. Gray Herb. lxiv. 32) this species falls near *M. Ruiziana* Poepp. and *M. lanuginosa* DC., from both of which it is to be readily distinguished by its smaller, thinner, greener leaves and lack of the copious velvety or silky indument characteristic of the species mentioned.

M. (§ Spiciformes) Steinbachii, spec. nov., semivolubilis 3 m. alta; caule tereti fistuloso post exsiccationem costulato; internodiis

ca. 1 dm. longis; foliis oppositis breviter petiolatis ovatis acuminatis integris cordatis supra atroviridibus glabris subtus paullo pallidioribus obscuris pinnatim 5-nervatis in venulis reticulatis minute tomentellis 10 cm. longis 7 cm. latis; paniculis ramos breves paucibracteatos terminantibus ovoideis puberulis ca. 2 dm. longis 10–13 cm. diametro; spicis densis patentibus breviter pedunculatis plerisque 1–3 cm. longis 1.5 cm. crassis; capitulis omnibus sessilibus vel infimis brevissime pedicellatis patentibus 7–8 mm. longis; bracteolis ovatis vel ovato-lanceolatis acutis ca. 1.5 mm. longis; involucri squamis oblongis obtusis stramineo-viridibus vel aetate atrobrunneis glabris lucidulis striatulis 4.5 mm. longis; corollae tubo proprio gracili 1.5 mm. longo; faucibus aequilongis turbinato-campanulatis; dentibus limbi parvis recurvatis ca. 0.5 mm. longis; achaeniis gracilibus nigrescentibus 3 mm. longis; pappi setis ca. 25 primo argenteis aetate carneis corollam aequantibus.—BOLIVIA: Dept. Santa Cruz: Prov. Cercado: Bañados del Piray, alt. 450 m., 18 July, 1924, *Jose Steinbach*, no. 6257 (K., phot. Gr.).

M. (§ CORYMBOSAE) TAFALLANA HBK. Nov. Gen. et Spec. iv. 137 (1820). Thus far this species seems to have been recorded only on the basis of the original material, said to have been obtained from the banks of the Daule River near Guayaquil, Ecuador, *Tafalla* (Par., phot. and fragm. Gr.). It is now possible to report indications of a second station, as follows: PERU: Pillao, Lima, from the herbarium of *Ruiz & Pavon* (K.). This supposed Peruvian material in the Kew Herbarium consists merely of a single large detached leaf and a fruiting corymb from which the corollas have fallen. While this material agrees closely with the type-material at Paris, even to the precise shade of the unusually reddish-brown pappus, it must be borne in mind that there was much laxity in the geographic labelling of these early collections. In fact, both the Ecuadorian and the Peruvian stations will have to be subject to some doubt until they can be substantiated by rediscovery and more complete specimens.

M. TENAX Sch.-Bip. Bonplandia, iv. 54 (1856), as a mere nomen nudum. When revising the Mikanias of Peru, the writer, Contrib. Gray Herb. lxiv. 72–95 (1922), had seen no representation of this unpublished species. Subsequently he has been able to examine and to borrow for more detailed study the isotypes (Lechler's no. 2355) from the Royal Botanic Gardens at Kew and from the Conservatory of Botany at Geneva. The species appears, in fact, to be a good one, pretty readily distinguishable from any previously described. It may be characterized and given proper standing, as follows:

M. (§ Thyrsigerae) tenax Sch.-Bip. (hucusque ined.), volubilis

perennis vel verisimiliter fruticosa; caule subtereti post exsiccationem costulato-angulato brunneo juventate puberulo-scabrato maturitate sublaevi; internodiis plerisque 5–10 cm. longis; foliis oppositis breviter petiolatis oblongis acuminatis integris basi subacutis utrinque viridibus glabris pinnatim 7-nervatis firmiter chartaceis 6–11 cm. longis 3–4 cm. latis supra lucidulis subtus vix pallidioribus obscure punctatis; petiolo gracili puberulo ca. 1 cm. longo; paniculis terminalibus et lateralibus sordide incurvo-puberulis basi foliaceo-bracteatis; capitulis 6–7 mm. longis ad apices paniculae ramulorum glomeratis sessilibus vel brevissime pedicellatis; involucri squamis oblongis obtusis ciliatis brunneis glabriusculis vix striatis 4 mm. longis 1.5 mm. latis; corollae tubo proprio gracili ca. 1.5 mm. longo; faucibus turbinatis ca. 2 mm. altis; dentibus limbi deltoideis ca. 0.8 mm. longis; achaeniis (immaturis) laevibus 2 mm. longis; pappi setis ca. 35 albidis vix scabratis.—PERU: in mountains near San Govan, July 1854, *W. Lechler*, no. 2355 (K., Gen., phot. and fragm. Gr.).

Among the Peruvian Mikanias hitherto described *M. tenax* may well be placed near *M. lasiopoda* Robinson (which differs in its setose indument, and in its distinctly punctate leaves which are cordate at the narrowed base) and *M. caustolepis* Robinson (which has more ovate leaves, relatively longer petioles, and peculiar fuscous-puberulent phyllaries).

KUHNIA ADENOLEPIS Robinson, Proc. Am. Acad. xlvii. 201 (1911). This species, thus far known only from the original material, collected by Pringle in the Chapala Mountains near Guadalajara, has been rediscovered by Mrs. Mexia at San Sebastian, Jalisco. Mrs. Mexia's specimens, while manifestly conspecific with the type, show some variation, having leaves somewhat shorter, broader, and often sharply few-toothed. Some of the middle and lower leaves are subopposite or occasionally ternate. The pappus (still undiscolored) is bright white. The species is one which forms a transition to *Brickellia*, in which, with almost equal propriety, it might have been placed.